BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 30.] 1933. [No. 10.

MEDICAL EDUCATION IN UGANDA.

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(Received July 10, 1933.)

An account of the development of medical education in a comparatively primitive country may be of guidance to those engaged in or starting such work in similar circumstances.

Medical Organization of Uganda.

As a preliminary it is necessary to have an idea of the medical organization of the country in order to understand the aims of medical education and the role its products are intended to play in this organization. For administrative purposes Uganda is divided into districts with British Commissioners and Assistants in charge. A British Medical Officer is in medical charge of each district and is responsible for all medical and sanitary work therein. In certain cases he may be assisted by one or more Medical Officers. He has a district hospital at the headquarters station, and there may be smaller sub-hospitals at other stations in the district. There are also dispensaries at populous centres. Generally speaking the sub-hospitals and dispensaries deal with minor or simple cases, paying special attention to venereal diseases, yaws, trypanosomiasis, etc., and would evacuate to the district hospital cases of a serious or difficult nature requiring special skill in investigation and treatment.

As a rule, at the district hospital, there are one or more Asiatic Sub-Assistant Surgeons, assisting the Medical Officer and taking charge during his absences while touring the district. Sub-hospitals are managed by Sub-Assistant Surgeons also. These officials have received their medical training in India and have Indian qualifications or degrees, except in the case of those who have been promoted from the compounder or dispenser grade. A British Nursing Sister is posted to many of the larger district hospitals, supervising the work of the African nursing staff. The latter are of both sexes, male nurses dealing with the men and female with the women, though it is customary for male nurses to perform special duties, such as the giving of intravenous injections, on the female side.

Historical Review of Medical Education in Uganda.

In the process of describing the aims and methods of medical education something in the nature of a historical review of events will be attempted, as an account of the development of the scheme provides as much, if not more, guidance than an account of the scheme as it operates at the present time.

Real medical progress dates from the conclusion of the war, and perhaps the most eventful change was the conversion of the large venereal unit at Mulago, near Kampala, into a general hospital, for upon this change depended the possibility of initiating medical education.

Concurrently and indirectly equally eventful was the awakening of Government to its responsibilities in the matter of general education, in which it had previously taken no concern, except to give educational grants to missionary societies.

After the war, Government decided to build a college at Makerere, near Kampala, the original conception of which was in the nature of a technical school for the teaching of the crafts, with a section devoted to training of boys as subordinates in the Medical, Agricultural and Veterinary departments. Subsequently a further step was taken and an education department formed. Since then Makerere College has changed its status considerably, the technical side has been transferred to a separate institution, and it now concerns itself only with providing a higher general education, preparing its pupils chiefly for such posts as schoolmasters, clerks, and assistants in scientific departments of Government.

In 1923 I was appointed Medical Tutor at this institution, charged with the duty of undertaking the organization of a scheme of medical education. I was, be it noted, attached to the Education Department. The problem at the commencement was what to aim at. A medical school had been in operation for some time at the neighbouring hospital of the Church Missionary Society, where the pupils were taught in the vernacular. I believed that the vernacular was unsuitable for the communication of scientific ideas, and its use would further deny all access to medical literature. Knowing that there were boys at the higher grade schools who had a very reasonable knowledge of English I resolved to use it as a sole medium of instruction.

The objective was the production of an assistant of the type of the Asiatic Sub-Assistant Surgeon, capable of diagnosing and treating the commoner and simpler diseases of the country, able to recognize many of the more complicated conditions, and to appreciate the possibilities of major medicine and surgery in more expert hands.

It was decided to embark on a course similar to that obtaining in Europe, but pruned and simplified greatly to suit local conditions, the local mentality and educational standard.

The original course, introduced in 1924, was as follows :—

First year—Chemistry, Physics, Botany, Zoology.

Second year—Anatomy, Physiology.

Third and fourth years—Medicine, Surgery, Pharmacy, Laboratory Methods.

Although the results were satisfactory in some respects, many defects existed. The pupils were backward in mathematical knowledge and their English, while good, left something to be desired. Anatomy presented special difficulties. Dissection was impossible, and the

subject had to be taught largely by resort to models, bones and illustrations, with occasional visits to the post-mortem room at Mulago hospital, a distance of about one mile from Makerere. The third and fourth year subjects presented further difficulties. I could not, single-handed, teach everything, and though I had access to Mulago Hospital for the purposes of clinical teaching, this did not suffice, and I had to ask for assistance in this respect. The hospital, however, was not sufficiently or adequately staffed to give all the assistance desired and pressure of routine work frequently resulted in the relegation of teaching to the background. It will be noted that Obstetrics and Gynaecology were not included in the curriculum. It was felt that the course was sufficiently full for an experimental start, and further that the time was not quite ripe for the introduction of these subjects. It was feared that the performance of pelvic examinations by young men on young women might discredit the hospital and hinder the cause of medical education.

It was soon apparent that the omission was serious, and that even if students were never actually to practise midwifery and gynaecology, these subjects must be an integral part of any system of medical education; as many of the aspects of medicine and surgery could not be appreciated properly without a basal knowledge of them. They were therefore introduced into the course for the second batch of students entering in 1925, and by the exercise of tact and supervision pelvic examinations caused no offence. It will also be observed that Pathology did not find a specific place in the curriculum. It was, however, taught, as far as possible, in the course of the lectures and demonstrations in medicine and surgery. The exclusion was due to the fact that no expert teacher was available, as the main Protectorate laboratory was twenty-six miles away. Since then this laboratory has been transferred to a site at Mulago and the subject is now taught by a member of its staff.

Further Development.

It will be realized that a system whereby an educational department was responsible for the whole of medical education was neither ideal nor practical, and opportunity arose in 1927 of making a change, when I became Medical Superintendent of Mulago Hospital and Principal of the Medical School to be established there.

It only remained to complete and elaborate the development referred to previously in order to fit the hospital for an ideal training ground. At the present time there is excellent accommodation for in-patients and a commodious well designed out-patient department with special departments has been built.

The infectious diseases hospital, formerly a separate unit in Kampala, has been transferred to Mulago, and as already recorded, the main Protectorate laboratory is now located there. Moreover it is the intention to build a new mental hospital for the protectorate and to place this also at Mulago.

The combined unit will therefore enable students to study every branch of medicine on the spot, and incidentally will lead to economy in management. One thing is lacking, X-ray and electrotherapy apparatus, but it is hoped that the omission will be corrected when funds permit.

The adequacy of the hospital for teaching purposes is shown by the following figures for 1932 :—

Beds 250 and 8 cots, isolation hospital not included.
In-patients 5,702.
Out-patients. New cases 21,856. Attendances 53,609.
Surgical operations 1,663.

The evolution of the hospital was accompanied by a similar evolution of its staff. It became possible to depart from general practice type of work towards specialism ; and separate departments for Medicine, Surgery, Obstetrics and Gynaecology, Dermatology and Venereal Diseases, Ophthalmology, and Ear, nose and throat work, eventually came into being. Lectureships were established in Medicine, Surgery, Obstetrics and Gynaecology, Pathology, Bacteriology and Parasitology, Anatomy and Physiology, each lecturer being granted an allowance of £70 per annum. Smaller allowances of £50 per annum were granted to the Pharmacist teaching Pharmacy and to the Laboratory Assistant demonstrating Laboratory Methods and preparing specimens for the school museum. I attach great importance to these allowances as the posts are anything but sinecures. A great deal of preparation out of official hours is required when teaching students whose mentality and education are below European standard and often the construction of notes comparable to a text book is necessary. Moreover Medical Officers at a purely native unit have no opportunities for private practice such as district Medical Officers enjoy, and some reward for financial loss and extra work is essential.

A medical school of modest but sufficient size was built, providing three rooms, a dissecting room, a combined physiological and pathological laboratory, and a library and museum, each room being capable of use for other subjects than those for which they were specifically designed.

A hostel for residential purposes was built also. This is an absolute essential as the usual native dwelling gives no facilities for study. Moreover the advantages of living on the spot are very great, as students can be present at emergencies which generally occur out of official hours. Students are obliged to reside at the hostel, and in the same way as there is a Medical Officer on duty at night, so also students take turns of duty. It is in fact the custom for the student to be called first and make his examination before the Medical Officer arrives. Valuable experience is thus gained and a sense of responsibility inculcated.

Although medical education was separated from the Education Department, the separation was partial only, the teaching of the preliminary sciences continuing at Makerere College. It was, however, thought necessary to extend the one year devoted to these subjects to two, and in addition English and Mathematics were included, as a defective knowledge in these respects had been found detrimental to progress. The course was thereby extended to five years. The arrangement works admirably. Makerere College and Mulago Hospital are reasonably close, full contact is maintained between the two institutions, and a strong interest and liaison between the Education and Medical departments in matters concerning medical education is established.

It is also economical in that a common preliminary course serves for students at the college preparing for Medicine, Agriculture and Veterinary work. Students also have the advantages of the corporate life, discipline and participation in team games which can only be obtained at an educational institution of reasonable size. There is no mode of entry to a medical career except through Makerere College, and its

entrance examination is the most difficult which a boy leaving school can take. It is hard to make an exact comparison with parallel examinations at home; the range of subjects is narrower, and the standard, while advancing yearly, is very much lower, but a good knowledge of English is an indispensable qualification. Medicine is a popular career, the number of students which can be accepted is limited, and a certain further degree of selectivity operates in that students are observed carefully during their first year and if judged unlikely to make good are advised to choose a less exacting vocation.

It is the fact that Medicine generally claims the best educated and most intelligent boys and indeed it is exceptional for a medical student not to be the holder of a scholarship.

Curriculum.

The present course is arranged as follows :—

At Makerere College.

First year } Chemistry, Physics, Botany, Zoology, English,
Second year } Mathematics.

At the Medical School.

Third year ... Anatomy, Physiology, Pharmacy.
Fourth year Medicine, Surgery, Pathology, Bacteriology and Parasitology, Pharmacology and Therapeutics.
Fifth year ... Medicine, Surgery, Obstetrics and Gynaecology.

The academic year is divided into three terms, each of three months duration, with an interval of one month between terms. During the first three years these intervals are taken as holidays, but in the final two years students remain at the hospital during vacations except for an annual holiday of fourteen days. Lectures cease during the vacations, but students continue clinical work to extend their opportunities for gaining practical experience. Besides lectures there is of course much practical instruction and students are given appointments similar to the clerkships and dresserships in vogue in Great Britain, the appointments being changed every three months to give varied experience.

The position assigned to Obstetrics and Gynaecology in the fifth year seems to us more satisfactory than antecedent to Medicine and Surgery; we believe that the subject is picked up more readily after a grounding in Medicine and Surgery.

Lectures and Textbooks.

The reader no doubt will wish for some details of the lecturer's work. The lectures are absolutely systematic, guiding the student through the whole subject and attendance is obligatory. Frequently they consist of amplifications and explanations of the textbooks in use, while in some cases textbooks are dispensed with and the student furnished with typed notes covering the whole subject. We do not expect our people to read textbooks without guidance; we anticipate that they might pay equal attention to trivial detail and important principles. Clinical teaching is also part of a lecturer's duties.

While on the subject of textbooks it might be helpful to give some account of the place they take in the system. In the early stages of the scheme no use was made of books for the teaching of preliminary science. Notes were compiled and issued to pupils.

For the study of Anatomy and Physiology each student was given GROVES and BRICKDALE'S "Textbook for Nurses," a book dealing

with the elementary principles of Anatomy and Physiology and also Medicine and Surgery. This was supplemented by BUNDY'S "Textbook of Anatomy and Physiology." This book also is designed for nurses and is somewhat fuller than the first named. GROVES and BRICKDALE was used also for the teaching of Medicine and Surgery, typed notes being given amplifying the text. For Midwifery Comyns BERKELEY'S "Handbook of Midwifery for Midwives, Maternity Nurses and Obstetric Dressers" was used. As time went on we decided that we had the capacity to teach and the students the power to assimilate in a more advanced fashion and the elementary nursing books gave place to such books as the following :—

Anatomy—BEESLY and JOHNSTON'S "Manual of Surgical Anatomy."
Medicine—WHEELER'S "Handbook of Medicine," and the "Memoranda on Medical Diseases in Tropical and Sub-Tropical Areas" of the Army Medical Service.
Surgery—CHIENE'S "Handbook of Surgery."
Gynaecology—SOLOMON'S "Handbook of Gynaecology."

No book on Physiology is now used, the lecturer's notes being tantamount to a textbook. In obstetrics also the lecturer prefers to give full notes based on TWEEDY'S "Practical Obstetrics."

There is, of course, an adequate library of works larger than those mentioned. Students have access to this library, though it is intended to assist the lecturer more than the student.

Examinations and Subsequent Training.

Examinations are held at the following points in the course :—

Preliminary Sciences, at the end of the first and second years.
Anatomy, Physiology, at the end of the third year.
Pathology, Bacteriology and Parasitology, Pharmacy, Pharmacology and Therapeutics, at the end of the fourth year.
Medicine, Surgery, Obstetrics and Gynaecology, at the end of the fifth year.

On qualification, certificates are issued to successful candidates who receive Government appointments, with the title of Senior African Medical Assistant, at a commencing rate of pay of £7 *per mensem.* They become members of the native civil service and also are placed on the Uganda Medical Register in the same way as Sub-Assistant Surgeons, but are not permitted to set up in private practice on their own account. After qualification all Assistants remain at Mulago Hospital for six to twelve months and perform duties similar to those of house officers at home.

They receive special instruction in venereal diseases and departmental clerical duties. Owing to the extreme prevalence of venereal diseases very special attention is given to the subject, and every graduate is taught the details of the speciality in a far fuller manner than is possible in the time available in the pre-qualification period.

Standard Attained.

It is extremely difficult, in a short space, to give an exact idea of the standard attained. Full accounts of the Medical School are published in the annual reports of the Medical Department, and include the syllabus, examination questions, selected answers by candidates, examiner's comments and other details, and those who wish can obtain full information from this source. However, as no paper on this subject can be of much value without an indication of this standard I give

extracts from the examiner's reports to provide some guidance in this respect.

As an examiner in the final examination we have been fortunate enough generally to secure the services of Dr. R. Y. STONES, M.D., F.R.C.S., M.R.C.P., of the Church Missionary Society's Hospital at Namirembe, near Kampala. I quote the following extracts from his reports :—

1928. "The examination has been a revelation to me both in the standard of English attained and in the extent of knowledge acquired. These students are educated men in the broad sense and are fitted to profit by experience in their profession."

1931. "Comparing this examination with that of 1928 a uniform improvement in the standard of medical education is found. A stiffer examination was set to test the knowledge of the students more thoroughly and it was proposed, if necessary, to accord marks more easily than in the previous examination. This was not found to be necessary as the students met the higher standard of questions asked successfully."

Dr. STONES also mentioned the names of two students whom he considered to have achieved honours standard.

1932. "This year to test the standard of attainment, for the first time many of the questions were selected from the easier ones set at the conjoint final examination of the Royal Colleges of Physicians and Surgeons."

"The questions, as will be seen from the examination papers, are not easy to answer without a good deal of independent thought and are not of the type which can be answered by mere book knowledge. As you know the African is an adept at quoting pages of a textbook from memory alone."

"The answers to these questions were on the whole good and showed a wide appreciation of the subject. Each of the candidates revealed the possession of a trained mind, shown by his ability to stick to the point and not to wander off the subject, thus little was missed, and what is more important to the examiner very little extraneous matter was added as packing."

So far as examinations can be accepted as a test, these remarks show that the standard of knowledge is reasonably high, but convey no information of practical ability. I personally have little fear on this account, as students enjoy greater opportunities for acquiring practical experience than do those in Great Britain. Both before and after qualification, in the field of surgery alone, they perform a great many operations such as circumcisions, curettage of ulcers, skin grafts, passing of bougies and catheters and give many anaesthetics. They also assist at major operations and even perform a few under supervision. In emergencies and when a Medical Officer is not available, they should be able to undertake such surgical work as amputations of limbs, operations for the relief of impassable stricture and extravasation of urine, the application of obstetric forceps and should make a good attempt to deal with cases of strangulated hernia.

It is not expected that all will be successes, any more than one finds that all Medical Officers and Sub-Assistant Surgeons are so. Much depends upon personality and character in our profession, qualities which cannot be imparted by training.

I think that it is generally agreed that we have succeeded in our aim to produce an Assistant capable of replacing the Sub-Assistant Surgeon, and in fact several have replaced them with satisfactory results. I

quote an extract from a Medical Officer's report on an Assistant. "Intelligent and efficient, steady, sober, fond of games and sociable. He speaks and writes English well, his handwriting is clear and his books and notes on cases are kept neatly. He has been in charge of . . . hospital for over a year and has given the utmost satisfaction. He is sound professionally and rarely makes a mistake in diagnosis. He is competent at anaesthetics, microscopical work and venereal diseases. He is interested particularly in midwifery and operations and spends his free time in studying medical works."

There are good reasons for employing the native inhabitant apart from the point that he has a claim to employment in his own country if suitable. No European or Asiatic can get to the hearts and minds of the people as can one of their own kin, and the African Assistant, by close contact, precept and example, should exert a most favourable influence upon his own people in matters of health.

Future of Medical Education in Uganda.

A few words on the future of medical education in Uganda are necessary. There is little doubt that Makerere College is destined to be the centre of higher education for Eastern Africa, and I feel sure that the Uganda Medical School will take a similar position in regard to medical education. There are in fact, at the present time, at both institutions, students from other East African countries and I understand that it is likely that their numbers will increase. Is it probable that we shall raise our standard much in the immediate future ? As I have retired from the Uganda service I cannot speak with authority, but I surmise that consolidation and the development of post-graduate education are more probable than much advance. The present standard is sufficiently high for practical purposes and indeed I doubt whether it is possible to advance much further without extravagance in staff and equipment, for advance depends perhaps more upon the teacher than the pupil. There is one change which we hope to adopt when the standard of general education rises sufficiently and science is taught adequately in the schools. We expect then to reduce the two year preliminary science period to one year. This will enable Anatomy and Physiology to be advanced to the second year and extend the final period, devoted to the study of Medicine proper, to three years.

It may be expected of me to pronounce some opinion on the mental capacity of the African. I shall content myself by saying that he does seem capable of assimilating scientific ideas without much difficulty provided that pains are taken to simplify and explain, though with the present generation more concentrated and systematic effort by teachers is necessary than in Europe. The greatest attention must be given to stimulating the powers of observation and deduction. This is the most important point of all, for these powers are there but do require stimulation. The need for stimulus is to be expected when it is remembered that the students' immediate forbears concerned themselves with little beyond stock, crops, sexual matters and intertribal warfare.

I have referred to the desirability of simplification but the process must not be carried to the point of clinging always to rule of thumb methods and avoiding all difficult problems. It is most important to endeavour to produce a practitioner who can do much more than undertake mass treatments of prevailing diseases. It is essential to impress a native community with the great possibilities of European medicine, in order to gain its faith and confidence, for upon these depend

co-operation in such matters as compliance with public health rules and regulations. I have noted that this connexion between curative and preventive medicine is not always appreciated. Some time spent over the elucidation of difficult or rare cases is therefore not ill-spent; the faculties are sharpened, the spirit of enquiry is cultivated, and the pursuit of Medicine is given a touch of idealism and culture.

I would counsel anyone embarking on a similar project to restrict production to reasonable limits. Due regard must be paid to the fact that later products should be more valuable than earlier ones, and a consideration of the numbers that a service can absorb is most essential. Our output for the Uganda service is between three to five per annum, and for financial reasons it is possible that the lower figure may obtain in future years. This figure applies to candidates for Government service only. As I have stated already, there is no other outlet at present but the advent of the native private practitioner may not be very remote.

Training of Lower Grades.

In concluding this paper, the bulk of which has been devoted to what might be termed higher medical education, I must make some reference to the training of the lower grades of the medical service, for Mulago Hospital is a training ground of nurses of both sexes. Many will always be nurses and nothing else, but a proportion of the males eventually take more responsible positions in charge of country dispensaries, and for this reason, besides a training in nursing methods, instruction is also given in the recognition and treatment of disease.

Until recently vernacular languages were used as a medium of instruction, but as there was no single vernacular understood by all the various tribes uniform teaching was a difficult matter. With the advance of education it has been found possible to obtain candidates with a fair working knowledge of English which has now replaced the vernacular.

The curriculum extends over a period of three years. During the first six months learners are posted to wards to become acquainted with routine nursing work, and are observed as to their suitability for training.

In the second six months they pass through the Junior course. The class is concentrated in the general medical and surgical wards and performs all the routine work under the direction of Sisters and senior native charge attendants. A Sister gives demonstrations in nursing methods, adhering to a syllabus. An African Assistant teaches the elementary principles of the structure and function of the body and something of the nature, causation and prevention of disease. At the end of the course an examination is held and the results, together with a consideration of conduct, character and industry, determine promotion to a higher grade with increased pay. Those who have been successful at this examination return to routine duty for six months and put into practice what they have been taught. During the second six months of the second year they pass through the senior course. Demonstrations and lectures in more advanced nursing methods are given by a Sister, first aid is taught by the European Dispenser, using the St. John Ambulance textbook and further instruction by an African Assistant is given in elementary Physiology and Anatomy and in simple and standard methods of recognizing and treating the common

diseases of the country. At the conclusion of this course an examination is held, the results, as in the previous course, determining promotion and increased pay.

Systematic training is now ended but another year is spent at Mulago gaining practical experience, passing through the various departments, theatre and dispensary to this end. Some, at the request of District Medical Officers, may remain for another year's special training in theatre or dispensary work.

As a final word I must make it clear that I have spoken of Government schemes only. It is not within my province to do more than to record the fact that valuable work in medical training, especially of midwives, is carried out by Missionary Societies.

HELMINTHIASIS.

EGYPT, Ministry of the Interior. **Department of Public Health. Research Institute and Endemic Diseases Hospital. First Annual Report 1931.**—15 pp. 1933. Cairo: Govt. Press. [P.T. 10.]

A building has been erected and equipped into which the research section for ankylostomiasis and bilharziasis in Egypt moved in February, 1931, and it is hoped that it will prove a nucleus for a future Research Institute and an Endemic Diseases Hospital.

Apart from matter already noticed in this *Bulletin*, its work during 1931 comprised an attempt to exterminate snails in a localized area of 500 acres, which, after a parasitic survey, was abandoned, partly because neither the population nor the water supply was in fact isolated. The rowing pond in the Kobba Royal Palace has been freed from snails and stocked with gambusia. Leucocyte counts have been made in 35 cases of *S. haematobium* infection and in them no changes were detected after treatment. Experiments are being carried out on the life histories of molluscs. The Consultative Committee has decided that chemical tests suffice for determining the purity of carbon tetrachloride. Carbon tetrachloride in unstated dose cured in one treatment 24·78 per cent. of cases, as determined by an unstated diagnostic technique. The numbers of examinations and treatments for helminthic disease are given. *Clayton Lane.*

BLOCH (A.) & BIRCHER (Max Edwin). Eine Wurm-Enquete. [**A Helminth Survey.**]—*Schweiz. Med. Woch.* 1933. June 17. No. 24. pp. 594–597. With 2 figs.

Faecal examination, presumably by smear, of 277 children in 25 Children's Homes in Switzerland showed 22 per cent. worm-positive; 9 homes being free from infection.

Numbers found infected were: with trichuris 38, ascaris 29, enterobius 4. Infection increased with age, and comprised 46·7 per cent. of those between 10 and 14 years old. On stools sent in by 160 medical men, 1,031 examinations were made, with the following positive results: ascaris 135, trichuris 240, enterobius 12, taenia 2, total 389. Those from an intern practice numbered 1,209 with 497 positives; and in detail percentage: ascaris 14, trichuris 24, enterobius 1, taenia 0·2. *C. L.*

HIYEDA (Kentaro) & SUZUKI (Michisaburo). **Parasites of Manchurians.**—*Jl. Oriental. Med.* 1933. May. Vol. 18. No. 5. [In Japanese. English summary pp. 50–51.]

A detailed piece of work on faecal examination of 760 apparently healthy Manchurians, one to 6 examinations, presumably by smear, being made on each. The results appear to be essentially of local interest, but the maximum percentages of ascaris, hookworm and trichuris found were 85, 61·6 and 80·7. *C. L.*

SINTON (J. A.). **Helminthic Infections in Indian Anopheline Mosquitoes.**—*Records of the Malaria Survey of India.* 1932. Dec. Vol. 3. No. 2. pp. 347–351. [24 refs.]

A useful summary of the literature with the following new observations: *A. culicifacies* showed 3 larval nematodes entangled in the

malpighian tubes identified by KORKE as Agamomermis. Four anopheline larvae (*A. gigas* and *A. lindesaii*) from near Kasauli showed coiled nematode larvae 14 mm. long seeming to fill the entire body. *A. culicifacies* showed about 60 encysted trematode larvae, apparently identical with those already described by SINTON (*Indian Jl. Med. Res.* 1917. Vol. 5. p. 192). *C. L.*

JOURNAL OF PARASITOLOGY. 1933. Mar. Vol. 19. No. 3. pp. 242–256.—**Proceedings of the Helminthological Society of Washington. One Hundred and Forty-Ninth Meeting.**

John T. LUCKER reported that repeated intraperitoneal injection of *Trichinella spiralis* extract in 1 per cent. Coca's solution failed to immunize 2 white rats.

M. C. HALL urged that since scientific papers are international and read by many not too well up in the language in which they are written, 5 points should be observed: (1) Figures should be in numerals not letters. (2) In morphological descriptions superfluous words (*is, there is, is situated*, etc.) should be omitted. (3) Key words should be placed first in the sentence. (4) Compounded words with *like* or *shaped* should be hyphenated. (5) Colloquial terms should be avoided since they are in other countries as useful as the slang term " as long as a piece of string." *C. L.*

TAKASAKI (Juichi). **Eggs of Intestinal Parasites found in the Dirt under Finger Nails.**—*Jl. Public Health Assoc. Japan.* 1933. May. Vol. 9. No. 5. pp. 1–6.

In the Saitama prefecture 513 children were examined, and 3·7 per cent. had worm eggs under their nails, namely ascaris 2·92, enterobius 0·78 and trichuris 0·19. Compared with the intestinal infections the nail infections were for ascaris 15 to 347, and for trichuris 1 to 101. Presumably the faecal examination was by smear; enterobius eggs were so found twice only. *C. L.*

NÁJERA (L.). Una nuova tecnica per la numerazione di uova di elminti nelle feci. [**A New Technique for Enumeration of Helminth Ova in Faeces.**]—Reprinted from *Diagnostica e Tecnica di Laboratorio.* 1932. May 25. Vol. 3. No. 5. 9 pp. With 3 figs.

In effect this is a modification of Stoll's counting method by substituting a glass stoppered bottle for his rubber corked flask and a decinormal solution of carbonate of soda for caustic soda. A ruled counting cell is substituted for an ordinary slide and to the whole is attributed, quite pontifically, an extraordinary practical value. Similarly the allowances necessary for 5 kinds of stool consistence are definitely laid down, and for the proportions of male to female ancylostomes, necators and trichuris. No evidence is offered that this technique improves on Stoll's technique in any way. *C. L.*

VAN SLYPE (W.). Contribution à l'étude des helminthiases intestinales. [**Study of Intestinal Helminthiases.**]—*Ann. Soc. Belge de Méd. Trop.* 1932. Dec. 30. Vol. 12. No. 4. pp. 569–579.

In effect this paper investigates whether the pyramidon reaction in the serum due to absorption of shed blood, one common in a ruptured ectopic gestation, is upset by parasites which draw blood.

The pyramidon reaction is carried out thus. In each of 3 tubes place 8 drops of 50 per cent. acetic acid and 8 drops of peroxide of hydrogen. To tube 1 add 1 cc. of a 5 per cent. solution of pyramidon in alcohol and 2 cc. of 94 per cent. alcohol ; to tube 2 add respectively 2 and 1 cc. and to tube 3 add 3 cc. of the pyramidon solution. Mix. Draw off blood from a vein, incubate for 1 hour at 37°C. to hasten separation of serum, centrifuge this twice, and let a drop fall into each tube. It leaves a white track which in a positive reaction turns violet and then fades. The results in 63 cases were as tabulated.

Parasite	No. of cases	+ Reactions : percentage		
		strong	weak	total
Ankylostome	41	31·8	29·2	61·0
Schistosome	11	36·4	27·3	63·7
Strongyloides	9	22·2	0	22·2
Trichuris	3	66·6	0	66·6
Enterobius	2	0	0	0
Trichomonas	4	0	0	0

In multiple infections the elimination of hookworms may or may not make a positive reaction negative. The degree of reaction was not parallel with the number of eggs as obtained by a Stoll count.

C. L.

VAN SLYPE (W.). Contribution à l'étude des helminthiases intestinales (deuxième note). [**Study of Intestinal Helminthiases.**]—*Ann. Soc. Belge de Méd. Trop.* 1933. Mar. 31. Vol. 13. No. 1. pp. 85–86.

Transferred to the Kasai district, van Slype has continued his pyramidon serum investigation, this time in 26 ascaris-infected persons. There were strong reactions in 8, feeble in 8 and none in 10 ; or 61·5 per cent. of positives. Of 3 pure trichuris infections, two gave positive reactions and one negative, but since all had originally had multiple infections and the state of single infection was reached only after treatment the author does not press this point. *C. L.*

ALEXEIEFF (Georges). Sur l'hématopoièse dans les helminthiases. Sur la question de l'origine des éosinophiles. [**Haemopoiesis in Helminth Infections. Origin of Eosinophils.**]—*Folia Haematólogica.* 1933. Mar. Vol. 49. No. 3/4. pp. 444–446.

Sternal marrow was obtained on one occasion for each of 12 persons while each had several blood examinations. The number of myelocytes and megalokaryocytes in 500–1,000 cells was noted as also was the number of pro-erythrocytes and normoblasts to 100 white corpuscles. Infections were : with *T. saginata* 7 (2 having also *E. vermicularis*), *F. hepatica* 3, hookworm 1, hepatic hydatid 1. Usually there was parallelism between the production of eosinophils in the marrow and their numbers in the blood. Of 4 without helminths one had amoebiasis with " local " eosinophilia, in the blood 9 per cent. and in the marrow 14. In 4 leishmania cases there was a parallelism between loss of eosinophils from the marrow and from the blood. *C. L.*

PONS (R.). Les probabilités et le terrain vermineux. [**Helminth Infection: Predisposition and Exposure.**]—*Rev. Méd. et Hyg. Trop.* 1933. Mar.–Apr. Vol. 25. No. 2. pp. 95–99.

Pons sets himself to explain how, from simple mathematical data, it may be simply determined whether the actual helminthic distribution in a community of persons with reasonably uniform habits is due to individual predispositions or to exposure to infection. He concludes from analysis of figures from 1,250 examinations at Tonking and 850 at Saigon that in intestinal helminthic infections the question of predisposition need not come under consideration. *C. L.*

TERASAKO (S.). Ueber die Reizwirkung des Tetrachlorkohlenstoffs auf die Leberfunktion. [**Stimulus of Carbon Tetrachloride on Liver Function.**]—*Arb. a. d. Med. Fakultät Okayama.* 1933. Mar. Vol. 3. No. 3. pp. 370–385. With 3 figs. [50 refs.]

The apparently unconscious assumption here is that the action of carbon tetrachloride on the liver will be the same whether it is given in small or large doses and whether by mouth or injected intramuscularly. The latter procedure was adopted on dogs in this work and it is concluded that in doses of 0·001 to 0·0007 cc. per kilo [corresponding in a man of 70 kilos to a total dose of 0·07 to 0·049 cc.] carbon tetrachloride is not the hepatic poison which it has hitherto been held to be, but must be looked on as a means of bettering liver function, which was in fact measured by collection of bile through a biliary fistula. *C. L.*

CUTLER (Jessie T.). **The Influence of Diet on Carbon Tetrachloride Intoxication in Dogs.**—*Jl. Pharm. & Experim. Therap.* 1932. June. Vol. 45. No. 2. pp. 209–226. With 2 figs. [24 refs.]

"The effects of the following diets upon the degree of liver destruction and intoxication produced in dogs by carbon tetrachloride have been studied: (*a*) lean meat without bones, a diet very low both in calcium and carbohydrate; (*b*) lean meat and calcium salts; (*c*) bread and milk, a diet rich both in calcium and carbohydrate; (*d*) lean meat and dextrin, low in calcium but rich in carbohydrate, and (*e*) beef fat and cream, a diet very high in fat.

Diet given	Number of dogs	Percentage dying	Percentage without symptoms	Percentage of liver substance necrosed
Lean meat without bones	131	75	14	25 to 95
Lean meat and calcium salts	98	18	75	35 to 95
Bread and milk ...	14	14	79	30 to 90
Lean meat and dextrin ...	18	39	39	10 to 90
Beef fat and cream ...	8	26	62	40 to 70

"We have not been able to demonstrate any consistent differences in the amount of liver damage produced by carbon tetrachloride in the dogs on different diets. In every group, the amount of destruction, judged by an estimation of the per cent. of liver tissue necrosed, varied from moderate to extremely severe, with averages which were not significantly different.

"On the other hand, the severity of the symptoms and the number of deaths secondary to the liver damage can be profoundly affected by the diet."

"The significant chemical changes in the blood of poisoned animals are an increase in guanidine and a severe and often fatal hypoglycemia. It is believed that the symptoms of intoxication and the hypoglycemia are secondary to the increase in guanidine. The antagonism between guanidine and calcium has been repeatedly demonstrated.

"Our experiments indicate that none of the above diets will protect the liver tissue from destruction by carbon tetrachloride. In order to be protective against the intoxication resulting from the drug, a diet should (*a*) not tend to increase guanidine as meat has been shown to do; (*b*) be rich in calcium to combat guanidine, and (*c*) be rich in carbohydrate to relieve hypoglycemia if it develops. Diets which fulfill these requirements have given us a high resistance to carbon tetrachloride with the least symptoms of intoxication and the lowest death rates."

[For previous work on this subject see this *Bulletin*, Vol. 25. pp. 417, 469; Vol. 27. p. 569.] *C. L.*

BERGMANN (O.). Oleum Chenopodii als Ursache einer Gehörstörung. [**Oleum Chenopodii as Cause of Deafness.**]—*Muench. Med. Woch.* 1933. May 12. Vol. 80. No. 19. pp. 734–735.

This well-known effect of chenopodium is reported as if a new observation.

A man had a herring for breakfast, 4 hours later 20 drops of novocaine (apparently 0·4 gm. in 10 cc.) to lessen vomiting, half an hour later 9 cc. of oil of chenopodium in black coffee [or over three times the minimum lethal dose], two hours later a dose of salts, twice repeated; he vomited all three. He became completely deaf for two days and his hearing has not yet fully returned, tests showing that there is damage to the auditory nerve. The moral drawn is that the greatest care is advisable in the administration of chenopodium oil. *C. L.*

MILNE (J. Coutts). **A Case of Beta-Naphthol Poisoning.**—*Malayan Med. Jl.* 1933. Mar. Vol. 8. No. 1. pp. 73–74.

By the courtesy of Dr. Coutts Milne some details can be added to the printed account: In the quarantine camp, Port Swettenham, treatment is given to all healthy persons without individual diagnosis. A male Tamil in the camp, aged 35 years, was given in the morning beta-naphthol in two doses of 10 grains (0·6 gm.) at an interval of half an hour, followed by a saline purge. He had 4 or 5 loose motions, took his meal at 5 p.m. well, was admitted to hospital at 8 in collapse and died in 20 minutes.

At autopsy the whole of the mucous membrane of the stomach and first 2 parts of the duodenum was studded with haemorrhagic spots, and the head of the pancreas was similarly affected; from the hepatic flexure downwards the mucous membrane of the large intestine was markedly congested as were the kidneys; the urine contained no albumen and no blood cells. [The minimum lethal dose of beta-naphthol is, then, lowered to 20 grains (1·3 gm.).] *C. L.*

WRIGHT (Willard H.), BOZICEVICH (John), UNDERWOOD (Paul C.) & SCHAFFER (Jacob M.). **N-Butylidene Chloride, a New Anthelmintic.**—*Vet. Med.* 1933. Feb. Vol. 28. No. 2. pp. 52–64. [15 refs.]

Experiments were carried out on chickens, cattle, horses, cats and dogs. Only the two last need be considered here.

In 21 dogs which received the drug at the rate of 0·3 cc. per kilo, the efficiency against ascarids was 96·5, hookworms 100, whipworms 7·8. Most showed no pathological lesions attributable to the drug. When they occurred they were as follows—Histologically there was in the liver moderate cloudy swelling, in some more than moderate; in one very marked fatty degeneration, in five slight to moderate; in one marked central necrosis but this animal had distemper with high temperature. In the kidneys of 3 slight cloudy swelling and congestion.

In 28 cats 1 showed slight gastritis and two very slight enteritis. The liver lesions were more severe than in dogs and in many of them there was acute toxic necrosis, lesions being most marked in young animals.

In man 5 cc. produced epigastric warmth with eructation and in one or two hours levitation without dizziness, and looseness of the bowels even in doses of 1 cc. [The doses noted above are at the rate of 21 cc. for a man of 70 kilos.] *C. L.*

BARLOW (C. H.). **The Effect of the "Winter Rotation" of Water upon Snails involved in the Spread of Schistosomiasis in Egypt, 1930-1931 and 1931-1932.**—*Amer. Jl. Hyg.* 1933. May. Vol. 17. No. 3. pp. 724–742. With 7 figs. & 2 charts.

The non-operculated snails *Planorbis boissyi* and *Bullinus truncatus* (= *B. contortus*) survive the drying produced by the winter closure of irrigation canals in Egypt.

The work was done during the closures of 1930–1 and 1931–2. Its origin is significant. While crossing the Fayoum desert Barlow found the non-operculated snails *Eremena desertorum* stuck to stones too hot to handle comfortably; yet when crushed they were wet, juicy and alive in a perfectly dry desert. That being so, might not *P. boissyi* and *B. truncatus* survive moderate drying? From a canal bed which had been empty for 30 days with a dry and deeply cracked bottom 82·4 per cent. of the former and 50 per cent. of the latter snails were found to be alive, though none were infected. They survive by the production of an epiphragm of silvery slime; planorbis thereafter merely shrinks far into the shell as it dries; bullinus however first arranges itself so that the aperture of its shell is pressed down into the mud. It makes in Egypt little attempt to dig itself in whereas in the Sudan at Abu Zabed it buries itself completely in quite a short time. Eggs readily die on drying. *C. L.*

ARCHIBALD (R. G.) & MARSHALL (A.). **Note on a Schistosoma Cercaria with Four Pairs of Flame Cells in the Body.**—*Parasitology.* 1933. Jan. Vol. 24. No. 4. pp. 542–544. With 1 fig.

In spite of their having 4 instead of 3 pairs of flame cells in the body as well as one pair in the tail, the view is expressed that these cercariae probably constitute an aberrant form of *S. haematobium.*

Bullinus truncatus which were shedding pigmented cercariae were exposed to miracidia from terminal spined eggs shed by a typical case of Soudanese vesical schistosomiasis. After 83 days they began to shed furcocercous cercariae almost completely covered with retrorse spines, having 3 pairs of penetration glands, 4 flame cells, and 2 of ciliated areas. *Cercopithecus sabaeus* exposed to skin and mouth infection, began 4 months later to pass blood and mucus per anum with terminal-spined ova, and when killed showed adult male and female *S. haematobium* in the mesenteric veins and terminal-spined ova in the mucosa of the colon. *C. L.*

CAWSTON (F. G.). **A Considered Opinion as to the Best Treatment of Bilharzia Disease.**—*East African Med. Jl.* 1933. June. Vol. 10. No. 3. pp. 90–92.

The size of superficial veins is rarely so small as to force the use of intramuscular emetine in preference to intravenous potassium tartar emetic, and this is fortunate since, though both are equally effective against schistosomes, the risk of severe damage to the heart and nerves is too great to justify that continuance of emetine injections through the fourth week which is essential for cure. Colloidal preparations of antimony are uncertain vermicides. "Fouadin . . . . often produces late vomiting and insiduous symptoms of hepatic disturbance which renders the treatment of a comparatively harmless disease an unnecessarily serious one." The advised treatment is: careful regulation and administration of potassium antimonium tartrate for not longer than a month, and this will cause no vomiting or other inconvenience to out-patients. *C. L.*

HASSAN (Ali). **A Note on the Treatment of Bilharziosis with Bismuth.**—*Jl. Egyptian Med. Assoc.* 1933. Jan. Vol. 16. No. 1. p. 96.

Neotrepol produced no change in the ova passed in the urine of a patient. The drug contains 0·08 gm. of precipitated bismuth in each cc. The course consisted of 18 injections at 3 days interval; four injections of 1 cc., four of 1·5 and ten of 2, or 30 cc. in all, containing 2·4 gm. of bismuth. *C. L.*

PERRET-GENTIL (A.). Notes sur les cas de bilharziose intestinale traités à l'hôpital de la Mission Suisse de Chicumbane (Afrique orientale portugaise). [**Cases of Intestinal Schistosomiasis treated in Portuguese E. Africa.**]—Reprinted from *Rev. Méd. Suisse Romande.* 1933. Mar. 25. Vol. 53. No. 4. pp. 193–206. With 2 charts.

Through this hospital there pass yearly about 1,800 cases and among them there have been in all during the last 5 years 429 cases of vesical and 120 of intestinal bilharziasis; though in another mission dispensary 10 of 15 stools examined showed ova of *S. mansoni*. Infection with both schistosomes is not uncommon, but while ova of *S. haematobium* have twice been found locally in stools, those of *S. mansoni* have not been found in the urine. The value of fouadin by reason of its slight toxicity and its intramuscular use is pointed out, but it has nevertheless produced nausea, vomiting and collapse in certain local cases. *C. L.*

HASSAN (Ali). **The Susceptibility of Bilharzia Miracidia to Different Salts and Different pH.**—*Jl. Egyptian Med. Assoc.* 1933. Mar. Vol. 19. No. 3. pp. 229–231.

The miracidia of *S. haematobium* and of *S. mansoni* were affected in like manner. They were killed in 4 hours by the following percentages of chlorides: sodium 0·9, potassium, magnesium or ammonium 0·7, calcium 0·5. An acidity of pH 5 killed them in 30 minutes, whereas with pH 11 they survived for this same period.

C. L.

GIRGES (Rameses). **The Clinical Aspect of Schistosomiasis Mansoni.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1932. Dec. Vol. 8. No. 2. pp. 99–148. With 5 graphs, 12 charts & 3 plates. [Spanish version pp. 149–192.]

A detailed study of the subject which should be consulted in the original. *C. L.*

LEE (C. U.). **Treatment of Schistosomiasis Japonica with Fouadin in Experimentally Infected Rabbits.**—*Chinese Med. Jl.* 1932. Dec. Vol. 46. No. 12. pp. 1169–1178. With 1 chart.

Thirty-six rabbits were subjected to infection, and later died or were killed. Three were then without evidence of infection; five contained males only; seven died before treatment was finished, all of them harbouring worms; six controls had no treatment, all became infected as shown by finding of worms, but one probably underwent spontaneous cure since none were found although conditions were favourable; fifteen were treated with fouadin, seven intramuscularly and eight intravenously. The dosage as compared with that advocated by KHALIL, namely 40 cc. for a man of 60 kilos, was much greater being 6 cc. for rabbits varying from 0·9 to 2·2 kilos. Of the seven cases treated intramuscularly five were cured or probably cured; in one 132 males and in the other 28 males and 10 females were found alive. Of the eight cases treated intravenously two were cured or probably cured, two were not cured, four relapsed, but one of the relapses later underwent spontaneous cure. Intramuscular injection was then more efficient than intravenous, but fouadin "falls short of an ideal specific." *C. L.*

HOEPPLI (R.). **Histological Observations in Experimental Schistosomiasis Japonica.**—*Chinese Med. Jl.* 1932. Dec. Vol. 46. No. 12. pp. 1179–1186. With 7 figs. (1 coloured) on 4 plates.

The tissue changes described fall into two parts, those round eggs and those in small hepatic vessels.

Round the eggs.—The line of reasoning is this: The free swimming miracidia may have attached a small droplet evidently coming from the lateral glands. Within the shell as the egg lies in the tissues there may be seen a similar droplet staining but slightly with eosin as do the lateral glands themselves; similarly staining matter may be so great in quantity as to push the miracidium aside and presumably it comes from the same source. In the tissues round the egg there may be found radiating flame-like threads staining vividly with eosin [the coloured plate is most striking]. It is concluded that almost undoubtedly this substance must be a secretion, that it must come from the lateral glands and not from the strongly eosinophil cephalic

glands, since Hoeppli has never observed strongly eosinophil secretion within the shell, and that it must change its affinity to eosin when it passes outside the shell. Nevertheless the tissue has a decisive influence since this radiating staining has in Hoeppli's hands appeared only in rabbits (though it is noted that FUJINAMI *et al.* (1916) reported it in man and animals) mainly in the lung, more rarely in the liver and only in a few instances in the intestine. Round this palisade lie degenerating polymorphs or a zone of frank necrosis with a belt of epithelioid cells and outside that round cells, plasma cells and large mononuclears. Fibrous tissue forms far less in animals treated soon after infection (fouadin was used) than in untreated, and its formation in excess is another feature of rabbit infection.

Regarding changes round the hepatic blood vessels particular remark is made of ramifying connective tissue strands round sublobular veins.

C. L.

ELSBACH (L.). Eosinophiele Appendicitis. [**Eosinophilic Appendicitis.**] —*Nederl. Tijdschr. v. Geneesk.* 1933. Mar. 18. Vol. 77. No. 11. pp. 1204–1209. With 1 plate. English summary (6 lines).

"1. Of 68 appendices removed in Suriname, 4 showed peculiar eosinophilic infiltrations of the submucosa, muscular and subserous layers. In 2 cases also eggs of schistosoma mansoni were present. 2. The etiology of the morbid changes must be an infection with the schistosoma mansoni, *i.e.*, a hematogenous infection. 3. Clinically the eosinophilic appendicitis assumes the pictures of the acute or the chronical appendicitis. The complaints disappear after appendectomie." *C. L.*

MAJANZ (A. I.). Der erste Fall von Bilharziosis in U.S.S.R. [**First case of Bilharziasis in U.S.S.R.**]—*Ztschr. f. Urol.* 1932. Vol. 26. No. 10. pp. 665–673. With 6 figs.

A man of 26 who came to Moscow from Africa. The interval is not mentioned. *A. G. B.*

BRADLEY (Burton). **Some Observations on Australian Human Trematode Endemiology based on Local Sheep Fluke Investigations.**—*Med. Jl. Australia.* 1933. Feb. 25. 20th Year. Vol. 1. No. 8. pp. 245–251.

"1. My field and laboratory work in investigating sheep fluke has, *inter alia*, disclosed circumstances suggesting the urgent need of a thorough investigation of the possibilities of importation and spread of certain trematode human infestations in this country.

"2. They suggest, also, that team work is desirable as the facts concerning such disease spread involve a wide range of knowledge, especially of biology, geology, chemistry and local socio-economic conditions.

"3. It seems desirable that careful attention be given by health authorities to the possibilities of preventing the danger of importation of carriers of the adult flukes concerned and their respective intermediate hosts.

"4. In the case of arrivals by air it is suggested that particular danger lies in the rapid movements of infected persons thereby provided. Here it would seem that microscopic tests should be made on arrival or shortly after.

"5. In steamer transport modifications might be made which, while still insisting on microscopic evidence of freedom from infection, might bring this about by the acceptance of proper certificates from recognized laboratories in the country of embarkation." *C. L.*

CHATRON (M.). Un nouveau cas de distomatose humaine à *Fasciola hepatica*. [**Fresh Case of Human Infection with** *F. hepatica*.]—*Bull. Soc. Path. Exot.* 1933. Jan. 11. Vol. 26. No. 1. pp. 24–25.

A man was sent to Plombières with a diagnosis of hepatic congestion and chronic appendicitis radiologically confirmed. He had fever and had lost 9 kgm. Examination of faeces after concentration (the method is unstated) showed a few eggs of *F. hepatica* which continued in spite of abstinence from flesh. *C. L.*

HUNG (See-lü). Ueber die Morphologie von *Fasciolopsis buski* beim Menschen in Hsiao-Shan. [**Morphology of** *F. buski* **in Man in Hsiao-Shan, China.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. June. Vol. 37. No. 6. pp. 315–317. With 1 fig.

It is concluded that the specimens in question are young *F. buskii*, barely mature. *C. L.*

ERHARDT (Albert). Testierungsmethode dreiwertiger Antimonpräparate an der Opisthorchiasis der Katze. [**Method of Testing of Trivalent Antimonials on Opisthorchiasis in Cats.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Mar. Vol. 37. No. 3. pp. 131–135.

—— & BRUMPT (L.). Wirkung der Brenzkatechindisulfosäure und ihrer Komplexverbindungen auf *Opisthorchis felineus* (Riv.) in vitro und in vivo.—*Ibid.* Apr. No. 4. pp. 182–190. With 2 charts.

The preparations used were antimony tartrate and fouadin, and the methods of appraisement a new egg-counting method and post-mortem examination.

The method of egg counting is described as that of Szidat modified in detail and used on a stool enriched by Telemann's method, mixed with 2 per cent. tragacanth solution in proportion of 2 to 5, using 0·0375 cc. of the suspension and counting the eggs in a Zschucke counting chamber. As for its value it is in fact used to check itself. The dose of antimony tartrate was 1·7 mgm. per kilo and of fouadin 3·4 mgm. per kilo given subcutaneously. Eight days later no opisthorchis were present in liver or pancreas. *C. L.*

TARASSOFF (W.). [**On the Differential Diagnosis of True and Pseudo-Dicrocoeliasis.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1932. Vol. 1. No. 1. pp. 50–52. [In Russian.]

About 200 cases of human infection with *Dicrocoelium lanceatum* were recorded in Russia between 1925 and 1929, and there is now a tendency to regard this infection as being fairly common. The author draws attention to the difficulty of distinguishing between true infections and cases when trematode ova taken with cooked food have passed through the intestine, since killed eggs cannot easily be differentiated from living ones. Repeated faecal examinations of patients on a diet from which liver is excluded, and the examination of duodenal juice are recommended as the only reliable methods for the diagnosis of dicrocoeliasis. *C. A. Hoare.*

VOGEL (Hans). *Himasthla muehlensi* n. sp., ein neuer menschlicher Trematode der Familie Echinostomidae. [*H. mühlensi*, **a New Human Trematode.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Feb. 23. Vol. 127. No. 7/8. pp. 385–391. With 4 figs.

A German on furlough from Columbia allowed himself to be examined at the Hamburg Tropical Institute and was given [perhaps as a routine measure] oil of chenopodium. He passed 5 flukes 11 to 17·7 long* belonging to the genus *Himasthla* which has hitherto been found in birds only.

The collar contained 32 hooks, including 2 corner hooks on each side. Testes oval in the axis of the worm, 0·645 to 0·95 by 0·26 to 0·39, cirrus in a cirrus sac and armed with rose-thorn prickles. Yolk glands reach from the tail end to the posterior end of the cirrus sac. Eggs measure 0·13 (0·114 to 0·149) by 0·075 (0·062 to 0·085). The new species is based on the armature of the cirrus and the size of the eggs. The history suggests that he obtained infection by eating raw shellfish. *C. L.*

BIRKELAND (Ivar W.). **"Bothriocephalus Anemia."** *Diphyllobothrium latum* **and Pernicious Anemia.**—*Medicine.* 1932. Feb. Vol. 11. No. 1. pp. 1–139. With 9 figs. [485 refs.]

A monograph reviewing the literature, with these conclusions :—

Most hosts of *D. latum* suffer no harm. Without anaemia there may be neuroses and fits ; or irregular bowels, glossitis and stomatitis ; or any transition from a normal blood to one with 4,000,000 erythrocytes to the cmm., this being taken arbitrarily as the dividing line between non-anaemia and anaemia. As for the anaemia, with few exceptions it is indistinguishable clinically, haematologically and pathologically from cryptogenetic pernicious anaemia, but while the latter has rapidly increased in Helsingfors hospitals since 1910, the former has steadily lessened since 1898 perhaps because of early treatment by family doctors. The early decades of life are most commonly affected. Achlorhydria is present in 84 per cent. of cases, and especially occurs after 20 years of age. Numbness and tingling are not uncommon, but the incidence of subacute combined sclerosis has not been fully investigated. Disinfestation has since 1885 reduced the mortality rate from 100 to 12, fatalities being greatest after 60.

Of the 750,000 persons in Finland estimated to be infected, anaemia develops in only 1 or 2 per 10,000 ; some of these die after disinfestation, some once cured may become reinfected without anaemia. More than 70 per cent. of 550 reported cases of *D. latum* anaemia have occurred in Finlanders, who belong to the Finno-Ugric race ; the inhabitants of Sweden, Italy, Rumania and Japan are heavily infected but surprisingly free of anaemia. Diphyllobothrium anaemia has been reported 15 times in 2 or more members of the same family ; and occurrence of this anaemia in one member and of cryptogenetic pernicious anaemia in another member has been reported in four families. Moreover recurrent anaemia has followed reinfestation in 4 or 5 cases (all cured), and in 17 cases cure of tapeworm anaemia has been followed by death from cryptogenetic pernicious anaemia in the absence of reinfestation, so that the role of the worm must merely be a precipitating one—a trigger mechanism. As possible explanations, the worm may alter the intestinal flora, it may harm the intestinal wall, may act as an irritant, or its toxins through the

*All measurements in mm.

circulation may alter metabolism. The host may fail to "detoxify," the success of treatment with liver and gastric wall may indicate these organs as the site of detoxification, and there is some evidence that pernicious anaemia is in the order of a " chronic foreign-protein reaction." The impression is that, in some, the tapeworm is the last straw and when this is taken off the prognosis is good, so that those surviving this anaemia may be classed as suffering from an abortive form of genuine pernicious anaemia. *C. L.*

PETRUSCHEWSKY (G. K.) & TARASSOW (Wictor). Die Bekämpfung des *Diphyllobothrium latum* in Karelien. [**Measures against** *D. latum* **Infestation in Karelia.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. June. Vol. 37. No. 6. pp. 307–315. With 1 map.

The authors collect together the records of 62 investigations on man and fish in Russia.

Of these records 30 show infection with *D. latum*; a map shows that the heaviest percentages of infection lie in the north-west of the U.S.S.R., running as high as 76 per cent. Where population is thickest, where fishing is a chief industry, and where feeding habits are none of the best, there is parallelism between infection of man and fish. Thus at Kronstadt the reported infection of *Perca fluviatilis* and *Acerina cernua* with plerocercoids was 51 and 82 per cent. respectively, and of *Esox lucius* 100 per cent. *C. L.*

MAHADEVAN (V.) & MENON (T. Bhaskara). **Hydatid Disease in South India.**—*Indian Med. Gaz.* 1933. Apr. Vol. 68. No. 4. pp. 206–208. With 1 fig.

Seven cases of hydatid cyst in Indians are reported, one of the breast, the others of the abdomen, one of the latter group being multilocular and apparently with an exogenous mode of development.

The rarity of this infection in India is held to be partly real, partly apparent. The first is due to the fact that the Indian dog is, possibly with the rarest exception, a pariah; he has no place in the home. [I have found hundreds of scolices in a single dog in Berhampore, Bengal.] The second is that such cases being unexpected are overlooked, indeed the forms of the provincial annual reports contain no heading for them. *C. L.*

MAC ARTHUR (W. P.). **Cysticercosis as a Cause of Epilepsy in Man.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. May 5. Vol. 26. No. 6. pp. 525–528. With 1 plate.

Of the last 22 cases of epilepsy admitted to Millbank Hospital 10 had cysticerci of *Taenia solium* (*C. cellulosae*), and Mac Arthur has himself met with over 20 proved cases of cysticercosis. The invariable history is that epilepsy appears during adult life or after service abroad. Another curious feature is that there is in most of them no history of a previous tapeworm, so that unless it is frequently possible to harbour and lose a tapeworm without knowing it, these men were not self-infected.

As shown by autopsy cysts may be entirely restricted to the brain, but the most generally helpful diagnostic sign is the presence of palpable cysts in the tissues. When the cyst walls have become calcified they throw small elongated, indeed spear head, shadows to X-rays. Hamilton FAIRLEY showed complement fixation in 5 cases, none in 3

and a doubtful reaction in one. Surgical treatment in cerebral cases should be undertaken with hesitation since autopsy in all 3 cases examined showed large numbers and wide distribution of cerebral cysts. Intravenous injection of antimony tartrate is being tried in treatment. *C. L.*

TERAI (T.). Sur un cas de Cysticercus cellulosae hominis. [**Human Infestation with** *Cysticercus cellulosae.*]—*Jl. Oriental Med.* 1933. May. Vol. 18. No. 5. [In Japanese. French summary p. 52.]

This condition is rarely met with in Japan and this case was remarkable in presenting a large number of cysts, 195 were counted and practically every part of the body seemed to be involved except the palms and soles. Blood examination revealed an eosinophilia of 30·5 per cent. *H. H. S.*

APPHATIE (I. Lucio Ymaz). Le traitement biologique de l'hydatidose humaine. (Communication préliminaire). [**Biological Treatment of Hydatid in Man.**]—*Rev. Sud-Américaine de Méd. et de Chirurg.* 1932. Oct. Vol. 3. No. 10. pp. 785–793.

In this preliminary paper the author reports the production from hydatid toxalbumin of an anatoxin which is obtained by formalization (0·4 per cent.) of hydatid fluid and its incubation for a month at 39°C. The injection of anatoxin into cyst carriers produces slow desensitization accompanied by the disappearance of sensitizing antibody from the serum. Dr. Apphatie rightly points out, however, that more extensive clinical observations including experimental investigations in infected rabbits will be necessary before the exact value of this preliminary communication can be determined.

N. Hamilton Fairley.

TURNER (E. L.), BERBERIAN (D. A.) & DENNIS (E. W.). **Successful Artificial Immunization of Dogs against** *Taenia echinococcus.*—*Proc. Soc. Experim. Biol. & Med.* 1933. Feb. Vol. 30. No. 5. pp. 618–619.

A marked degree of resistance to *Taenia echinococcus* infection was induced in 8 dogs. There were 2 controls.

Examination on at least 5 consecutive days having shown that the dogs were free from infection, they were injected 5 times at 3 to 5 days' interval. The first was by 0·5 cc. of the antigen suspension subcutaneously, the other by 1 cc. intramuscularly. Two antigens were used. 1. From scolices and germinative membrane of fresh fertile hydatids of cattle dried and powdered, and for use "a 1 per cent. phenolized (0·5 per cent.) suspension was prepared." 2. From scolices, germinative membrane, and cuticular membrane from fertile and non-fertile cysts, prepared as above. Six to 15 days after the last injections had been given to the prepared dogs they and two others were fed with fresh fertile hydatid cysts. Twenty-four to 48 days later all were killed. The intestines of the 2 controls were "literally lined" with the tapeworms, 1,385 to the square centimetre. In the prepared dogs none were seen by the naked eye, but the microscope showed, 0, 1, 3, 3, 5, 6 in six while in two dying at 7 and 17 days none were found. *C. L.*

MILLER (Harry M.), Jr. & GARDINER (Margaret L.). **Passive Immunity to Infection with a Metazoan Parasite,** *Cysticercus fasciolaris,* **in the Albino Rat.**—*Jl. Preventive Med.* 1932. Nov. Vol. 6. No. 6. pp. 479–496. With 2 figs.

This paper fills in the details of the preliminary announcement (this *Bulletin,* Vol. 29, p. 748). It notes that passive immunity to infection by a metazoan parasite has been demonstrated.

This was effected by intraperitoneal injection of serum, usually amounting to 1/25th of the body weight, taken from rats which had either been already infected with *C. fasciolaris* or had had an intraperitoneal injection of 1 cc. of a suspension of *T. taeniaeformis.* Checked by controls, injection of serum from infected rats gave complete immunity, from actively immunized rats a large measure of this, while injection of normal serum showed benefit as 198 is to 276. In one series the quantity of serum was progressively lessened and infection was not obtained till the quantity injected was as little as 1/400 of the body weight and then it occurred in one of the 4 rats used.

C. L.

DÉVÉ (F.). De l'existence de formes de transition entre l'échinococcose hydatique et l'échinococcose alvéolaire chez l'homme. [**Transition Forms between Multilocular and Alveolar Hydatid of Man.**]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 19. pp. 223–224.

Dévé has already pointed out [*ante,* p. 213] that ORTH, WEICHSELBAUM & DEW have reported connecting stages between the multilocular hydatid of cattle and the alveolar hydatid of man. In 1906 POSSELT maintained that he had found in the heart of man the two forms side by side and with no intermediate links. Dévé by the kindness of MARESH of Vienna has obtained and examined various sections of POSSELT's original specimen and has found in them all intermediate grades of structure. *C. L.*

REBELLO (S.), DA COSTA (S. F. Gomes) & RICO (J. Toscano). Sur l'emploi des cestodes humains (*Taenia saginata*) comme réactif pharmacologique pour l'étude des anthelminthiques. [*T. saginata* **as Test in the Pharmacological Study of Anthelmintics.**]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 21. pp. 509–510.

Proglottids of *T. saginata* expelled spontaneously or after a saline and received in water at 38°C. were employed to test anthelmintics. Movements ceased as follows in minutes: Extract of male fern 1 per cent., 55; infusion of Kousso 2 per cent., 35; of kamala 10; filmaron oil emulsion 1 per mille 40; thymol 5 "millimols" * 16; naphthol in same concentration 12. The action was always slower than with *T. serrata.* [Working acceptance of these figures implies of course a belief that it is these drugs themselves and not substances which the host's body produces from them that are the active anthelmintics.]

C. L.

* 1/1,000 part of a gram molecule, this being as many grams of a substance as are numerically equal to its molecular weight.

ROMERO CALATAYUD (A.). 27 casos de teniasis por *Hymenolepis nana.* [**Infestation with** *Hymenolepis nana.*]—*Medicina Países Cálidos.* Madrid. 1933. May. Vol. 6. No. 3. pp. 208–214. [20 refs.]

The author quotes BACIGALUPO who in Buenos Aires found 8·3 per cent. of 72 children [? 6] whom he examined to be infested with *H. nana* and 1·3 per cent. of 448 adults [? 6].

Working in Professor PITTALUGA's laboratories the author examined 200 children and found 27 or 13·5 per cent. to be harbouring this cestode. Clinically, some were apparently merely carriers and showed no subjective symptoms; others had intestinal disturbances, colic, diarrhoea, etc. He did differential counts of the leucocytes of all those positive and found eosinophilia in 24 of them, the highest being 16 in two patients, one of whom had trichuris also. The infestation is certainly more common [in Madrid ?] than is generally believed.

H. H. S.

LAPAGE (Geoffrey). **Cultivation of Parasitic Nematodes.** [Correspondence.]—*Nature.* 1933. Apr. 22. Vol. 131. No. 3312. pp. 583–584.

Certain alterations have been made to McCoy's method (this *Bulletin*, Vol. 27, p. 426) such as the use of sugar instead of salt for floatation and of 10 per cent. plain broth instead of agar inoculated with *Bact. coli* for culture. To induce unsheathing 1 in 20 Milton solution is advised, but further development does not seem to have been induced, though more than 200 media have been employed. *C. L.*

CORT (W. W.) & OTTO (G. F.). **The Ascaris Problem in the United States.**—*Southern Med. Jl.* 1933. Mar. Vol. 26. No. 3. pp. 273–276. With 1 map in text. [23 refs.]

This paper sums up recent work on ascaris infection done by American writers.

In the southern United States heavy infection is particularly associated with the Appalachian range but essentially it is not a question of altitude but of defaecation habits to which surroundings of houses may contribute. Where gross pollution has been found close to the house (actually in the house yard), there will be a familial distribution of infection whether this pollution is a peculiarity of the particular family, or of the families in general in a locality. As regards treatment, santonin is held far less effective than oil of chenopodium. Combination of the latter with carbon tetrachloride is mentioned, in which connexion it is noted "records of severe symptoms and occasional deaths have been reported following the use of this drug," carbon tetrachloride being probably under reference. The use of hexylresorcinol is cited as an important step forward. In prevention the necessity of providing privies suitable for children and of seeing that they use them is stressed, as is also the harm done by the fact that a surprisingly large proportion of rural schools have either no privies at all or such poor ones that the children will not use them. The question, as in so many diseases familiar to workers in the tropics, is essentially one of economics. *C. L.*

FORSTER (Ernst). Askaridenrekord. [**Record of Ascarids.**]—*Schweiz. Med. Woch.* 1933. May 13. p. 452.

The case is published as a justification, if such were needed, for the setting up of the Ascaris Commission which has been nominated by the Central Committee of the Association of Swiss Medical Men.

A girl of 10, who had vomited 6 ascarids and had abdominal pains and visible and palpable distension of the ascending and transverse colon, was given oil of chenopodium 0·25 cc. and santonin 0·03 gm. Within 4 days she passed 1,100 ascaris, namely on the first day 3, on the second 70, on the third 1,023 with over 900 in one stool, and on the fourth day 4. Immediate laparotomy had wisely been rejected. *C. L.*

BIRK (W.). Ueber den Nachweis von Spulwurmlarven im Auswurf. [**Ascaris Larvae in the Sputum.**]—*Deut. Med. Woch.* 1933. June 2. Vol. 59. No. 22. pp. 841–843. With 1 fig.

A girl of 10, who had repeatedly passed ascaris under treatments, suffered from persistent bronchitis, and at last ascaris larvae were found in the sputum. FÜLLEBORN is quoted as informing Birk that no instance was known in which such a find had been made in man. [Evidently Birk has misunderstood FÜLLEBORN, for in an experimental infection KOINO (this *Bulletin*, Vol. 20, p. 235) reported in 1922 that larvae were found in the sputum from the 9th to the 16th day after infection, 178 being so detected on the 11th day alone.] *C. L.*

PANAGIA (Antonino). Osservazioni sullo sviluppo delle uova di *Ascaris lumbricoides* (L.). [**Development of Eggs of** *A. lumbricoides*.]—*Ann. d'Igiene.* 1933. Feb. Vol. 43. No. 2. pp. 107–119. With 14 figs. [13 refs.]

The well-known development of ascaris eggs is illustrated by microphotographs, and addition is made to observations on the effect of physical agents on eggs.

At 18°C. a solution of 10 per cent. formalin increased the period needed for development from the normal of 35 days to 60 or 70 days, and the embryos did not then live for more than 15 days. When undeveloped eggs were kept at 0°C. for any period up to 30 days, development proceeded at the normal rate and resulted in active embryos as soon as the eggs were raised to 18°C.; if kept at zero for longer than 30 days development was apt to be rather slower and an increasing number of eggs died (up to 25 per cent.) as the period of cold was extended to 60 days. If eggs were embryonated ill effects of cold became evident after 20 days, while after 60 days 80 per cent. of the eggs were dead. *C. L.*

KELLER (A. E.). **A Study of the Occurrence of Unfertilized Ascaris Eggs.**—*Jl. Lab. & Clin. Med.* 1933. Jan. Vol. 18. No. 4. pp. 371–374. With 1 fig.

"1. A differential egg-count analysis was made on 1,103 specimens containing eggs of Ascaris lumbricoides.

"2. In this series 26·2 per cent. of the specimens contained unfertilized Ascaris eggs alone, 32·2 per cent. contained fertilized eggs alone and 41·6 per cent. contained both fertilized and unfertilized eggs.

"3. The relative percentage of fertilized Ascaris eggs increases with the increase in the intensity of infestation.

"4. The smallest number of fertilized eggs were found in the very light infestations, one to five female worms. When more than five female worms are present there is a progressive increase in the percentage of fertilized eggs." *C. L.*

WAGNER (Oskar). Immunisierungsversuche bei experimenteller Askaris-Infektion der Maus. [**Immunization Experiments with Ascaris Infection of Mice.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933. Vol. 78. No. 3/4. pp. 372–382.

As measured by the number of larva found in liver and lungs of mice (which had been fed 2 or more times with infective eggs from the pig ascaris) such infections induced considerable immunity. Feeding with dried adult ascaris produced the same effect. *C. L.*

SUÁREZ (Ramón M.). **Clinical Aspects of Uncinariasis.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1933. Mar. Vol. 8. No. 3. pp. 299–337. With 8 figs. on 4 plates & 4 charts. [24 refs.] [Spanish version pp. 338–366.]

This paper is not intended as a review of the symptomatology of hookworm infection (ASHFORD's classical work in Porto Rico dealt with that 30 years ago), but is a detailed and most important study of 21 patients with rather severe anaemia who were passing hookworm eggs, and were studied for an average of 50 days each.

Malaria, syphilis and bleeding piles were excluded. Fever was never complained of, but the temperature in six occasionally reached 38°C. and in two 39°C. The haemoglobin index was lower than Smillie's standard; thus in cases with over 400 worms it averaged 32 instead of 46. Nor did his classification into moderate and light infections on the basis of worm load hold; for cases with a relatively low worm count showed severe anaemia. Thus a child with 43 necators had 17 per cent. haemoglobin and another with 1,800 had 48 per cent. Egg counts by Stoll's method were no index of the worm load; thus of two consecutive cases tested the second had ten times as many worms but 100 times as many eggs in the faeces as the first. Malnutrition was a definite feature, for, although 80 per cent. showed oedema on admission and none on discharge, they all gained weight the average gain being 10 lbs. The summary states that in all cases kidney function as tested by phenolsulphonephthalein was unimpaired; there seemed to be relationship between oedema and nitrogen retention. All cases showed low blood cholesterol, low calcium and low serum protein, but unaltered albumen-globulin ratio. Basal metabolism lay between −33·6 and +28·4 and the idea of a subfunctioning thyroid is rejected. The cardiac condition was closely studied in 4 cases only and comment and conclusion are studiously avoided.

"All cases but 3 showed hypochromic anemia with predominant microcytosis. Three cases of macrocytic anemia found in this series were considered by the author as co-existing with the hookworm and not due to them.

"Cases responded to maximal doses of iron ammonium citrate in approximately the same length of time independently of the presence of the worms or their expulsion by vermifuge. The highest reticulocyte response was 21·6 per cent.

" Iron has been used in the treatment of hookworm anemia in Puerto Rico since a remote epoch. The Anemia Commission of Puerto Rico used Blaud and Vallet's pills to the amount of from 3 to 6 daily, in some cases. We had been using maximal doses since 1931.

" One case showed moderate response to special high organic-iron diet.

" The importance of the nutritional factor in the production of the hookworm anemia is evident in this series." *C. L.*

NISHI (M.). **Experimental Observations on the Blood-sucking Activities of Ancylostomidae, especially** *Ancylostoma caninum.*—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. May. Vol. 32. No. 5 (338). [In Japanese pp. 677–691. With 4 figs. on 1 plate. [15 refs.] English summary pp. 61–62.]

In all essentials a striking confirmation of the work of WELLS [this *Bulletin*, Vol. 29, p. 421].

Twenty-one dogs were anaesthetized with sodium barbital and the worms exposed, as a figure shows, in an inspection box. The rhythm of oesophageal contraction averaged 161 per minute, it was most vigorous between 38°C. and 40°C. and blood was passed by the worm about 4½ minutes after sucking began, but, if this were vigorous, in less than 1 minute. Afterwards its expulsion was periodic, about every 45 seconds at an average, but with a minimum interval of 12 seconds. As regards the waste of blood induced, it was calculated that a worm passed per rectum 0·144 cc. in 24 hours though when activity was great loss was at the rate of 0·484 cc. At the same time the waste through the worm's mouth was calculated as 0·216 cc. daily, so that taking both ends it might amount to 0·7 cc. daily caused by each worm. At the same time a surrendered bitten surface of gut bled for 26 to 65 seconds, whereas an artificially injured spot did so for 20 seconds only. As WELLS reported, biting produces engorgement of the local blood vessels. *C. L.*

DE LANGEN (C. D.). De oorzaak der anaemie bij ankylostomiasis. [**The Cause of Ankylostomiasis Anaemia.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. May 9. Vol. 73. No. 10. pp. 592–617.

The most important theories of the cause of this anaemia are :—(1) It is caused by the constant loss of blood from the intestine. (2) It is due to a helminthic secretion, which may act as a haemolysin, or on the blood forming organs to give rise to an aplastic anaemia, or prevent the normal coagulation of the blood from the small wounds in the intestine. (3) It is dependent for its development on external circumstances, such as food or hygiene. (4) It is explained by the occurrence of secondary bacterial infection through the intestinal lesions.

Laboratory workers seem to favour the theory of blood loss, while the clinician, who sees the patients with characteristic pasty look, orange-yellow colour and eosinophilia prefers that of a toxic action. In explaining this anaemia it is necessary to build upon a physiological foundation and especially to consider the process of normal destruction of erythrocytes and their regeneration. A detailed reference is made to the lipoid covering of the red blood cell, its content in cholesterin and lecithin respectively and the antagonism of these latter to one another in both a physicochemical and a biochemical sense. The actual destruction of blood erythrocytes may be taken to be a

haemolysis and in this connexion the resistance of the lipoid layer of the erythrocyte would be dependent on the ratio of cholesterin to lecithin or to free fatty acids, a ratio which has received the name of the lipocytic coefficient. It is not possible here to follow the author through his entire argument and it will suffice to say that he does not favour the toxin theory as a total explanation of the cause of ankylostome anaemia, although he does not exclude it altogether. He also admits the fact of blood loss.* It is to the feeding, however, especially of the Javan in contrast to the European that he ascribes an important role in the production of the anaemia. In this food carbohydrates preponderate, protein is less than in a European diet and the protein is essentially of vegetable origin, while fats and the essential lipoids are of subordinate importance.

One concluding sentence may suffice to indicate the position taken up—" Loss of blood, poor feeding and the condition of the intestine combine together to produce a severe anaemia. Whether, in addition, a toxic injury of the bone marrow plays a part requires further research." *W. F. Harvey.*

†Fülleborn (F.). Ueber die Taxen und das sonstige Verhalten der infektionsfähigen Larven von Strongyloides und Ancylostoma. II. Mitteilung.—*Zent. f. Bakt.* I. Abt. Orig. 1932. Nov. 17. Vol. 126. No. 3/4. pp. 161–180. With 12 figs. [13 refs.]

Lane (Clayton). **The Taxies of Infective Hookworm Larvae.**—*Ann. Trop. Med. & Parasit.* 1933. July 7. Vol. 27. No. 2. pp. 237–250. [17 refs.]

As both papers are concerned with various taxies exhibited by infective larvae of Strongyloides and hookworms, it will be convenient to deal with them in the order in which they are discussed by Fülleborn.

1. *Hydrotaxy.*

Fülleborn quotes from Lane's 1930 paper [this *Bulletin*, Vol. 28, p. 228] " an animal normally living in water as a medium essential to its life can hardly have a taxis to a body of water outside that in which it is living " and points out that infective larvae of Strongyloides and Ancylostoma are not exclusively water inhabitants since they normally occur in moist soil where faeces are deposited. He describes again the formation of tufts of infective larvae at the edges of cultures and details how, as the atmosphere becomes dry, the tufts shrink and then grow again as the atmospheric moisture increases. This he regards as evidence of a positive hydrotaxy.

Lane replies to these considerations at length and points out that infective larvae are obligatorily aquatic in habit and that he uses the word *water* as meaning literally H_2O in liquid form ; declaring that a microscopic animal requires but a microscopic film of water for life. Such films must be present even in dry faecal masses else larvae could not survive in them. He discusses the various phenomena described by Fülleborn, retraction and growth of tufts, etc., and concludes that these do not constitute evidence for hydrotaxy but are to be accounted for as due to the operation of physical forces. Increase of moisture

* Wells has shown that the dog hookworm, *Ancylostoma caninum*, sucks blood from the intestinal wall and that each worm rids the host daily of 0·84 cc. of blood. [This *Bulletin*, Vol. 29, p. 421.] These observations have been fully confirmed by Nishi (above).

† We regret to record Professor Fülleborn's death on September 9.

in the air leading to larger drops with consequent growth of the tufts and decrease of moisture having the opposite effect, *i.e.*, the retreating drop pulls the larvae back with it.

The two authors do not use the word *water* in quite the same terms and it is certainly difficult to escape from Lane's view of the obligatory nature of water for the continued life of infective larvae.

2. *Thigmotaxy.*

Fülleborn discusses Lane's account of the behaviour of larvae in water-filled cubical glass boxes in which they assemble at the bottom and bore against the edges and corners. He has repeated these experiments and confirms Lane's observations but points out that the so-called side-slipping shown by the larvae is not actually a lateral movement but is a dorso-lateral one since only dorso-ventral flexure occurs in nematodes. He does not agree that larvae once at an edge or corner cannot move backwards or away from it. He points out and illustrates by a photograph that the head of a larva is not always in contact with the surface against which its motion is directed. Again, if larvae are in shallow tongues of water or in a layer of water between two ridges of vaseline they bore against the air-water edge and against the vaseline. He then discusses the behaviour of larvae closely assembled together in compact groups all the individuals of which are in uniform movement like a phalanx. He agrees that when such larvae actively bore at the edge of a drop they are activated by a thigmotactic stimulus due to the surface tension at the edge. Such behaviour, he agrees, is comparable to the boring of larvae against the edges and angles of a glass box. Fülleborn does not think that contact of a larva with a resistant surface can act as a directing influence on the individual since the actual point of contact is so small as to be practically a mathematical one.

Lane defines thigmotaxy more exactly and in agreement with Fülleborn's (1924) definition, as a directing impulse produced by contact with stable objects. He rejects as misleading Pintner's modification that for the calling out of thigmotaxy the object should have holes in it. He then discusses this stimulus under two heads, Positive and Negative Thigmotaxy. Under the former, his main points are that larvae set themselves roughly at right angles to any obstacle they encounter and that in outstanding numbers they lie close to obstacles just where they would lie if influenced by positive thigmotaxy. He disagrees with Fülleborn's contention that the point of contact of the head, being but a mathematical point, can hardly have a directing influence on larval movement and points out that the anterior face of the head has six papillae which may furnish the individual with directional impulses according as first one and then another of them comes into contact with an obstacle. He insists that the setting of larvae primarily at right angles to an opposing surface is really a matter of observation. Under Negative Thigmotaxy he discusses the behaviour of closely packed waving larvae and suggests as an explanation that it may be due to a negative thigmotaxy possessed by larvae when touching on their dorsal and ventral surfaces. With larvae closely packed, a retraction of one larva will bring its opposite surface into contact with its neighbour which also will shrink away at the point touched. In this way the swaying rhythmical movement of the whole group may be brought about. Finally he indicates the implications of thigmotaxy in relation to skin penetration and considers that it is of all

others the taxy most essential for the preservation of the individual and the one chiefly concerned in the act of skin penetration.

There seem to be but small grounds of difference between the authors on this taxy; the chief one being on the possibility of the directional stimulus of the individual larva through contact of its head with an obstacle.

3. *Behaviour of Larvae in narrow spaces.*

Larvae in water confined in narrow tubes, the width of which is less than their length, bore the head against the side of the tube. The body, however, cannot complete its usual movement, the middle region becoming pressed against the wall where it remains motionless for a short time. The head then jerks to the other side of the tube and the body movement is repeated. This motion becomes spasmodic and of such a nature as to suggest that it is purposive for the liberation of the larva from a confined space.

4. *By what Mechanical influence is the motion of larvae incited?*

The serpentine movement of larvae is excited when the head end comes into contact with some kind of resistance or when the larvae suffer from lack of space. It is also actively called out by pressure on any other part of the body tending to pin it down. *e.g.*, when threads of glass wool rest on it; the larva tries to extricate itself.

5. *Positive Oxygen and Negative Carbon Dioxide Taxy of Strongyloides Larvae.*

Fülleborn showed in his 1924 paper, by means of a double gas chamber, that Strongyloides larvae exhibited a positive taxy to oxygen and a negative one to carbon dioxide. In his 1930 paper, Lane brought forward certain observations of Boycott's on the resistance of infective larvae to lack of oxygen and excess of carbon dioxide. Fülleborn (1932) now replies that these considerations are irrelevant since Boycott was dealing with infective hookworm larvae whereas his own observations were made on Strongyloides larvae. Lane (1933) confesses to continued scepticism as to the validity of the conclusions drawn by Fülleborn on these taxies.

6. *Lane's "Chemical Activation."*

Lane (1930) observed activation of hookworm larvae on the addition of serum and considered that some substance from the serum had penetrated the sheaths and stimulated motility. He concluded that nutritive substances might also pass through the sheath and thus serve to nourish the enclosed larvae, thereby prolonging life. Fülleborn (1932) suggests that the activation observed on the addition of serum was probably caused by the production of a stickiness of the cuticle giving rise to a clumping effect such as he had described in his 1924 paper for Strongyloides larvae. He considers it as improbable that nutriment is taken in through the sheath but that the sole nourishment of the larva is its store of reserve food. Lane (1933) replies that the weak solutions of serum which he used produced no stickiness or clumping of the larvae. He still considers it probable that nutrients can pass through the sheath to be used by the enclosed larvae and reasonable to doubt whether the food reserves stored in the body constitute the larva's sole nourishment.

7. *Rheotaxy.*

Fülleborn refers to his 1924 paper in which he had shown that, when active Strongyloides and Ancylostoma larvae are introduced into a narrow tube through which water is streaming, they turn and head up-stream whereas in wider tubes they do not do so. He criticizes Lane's (1930) objections as to the validity of this evidence for occurrence of rheotaxy and says that had Lane carefully repeated his experiments he could not have failed to observe the effect. He thinks, however, that Lane's suggestion that the phenomenon is due to the shape and balance of the organisms is worthy of consideration and describes experiments in which he used models of larvae, made from strips of wood and with heavy heads, which headed up-stream when placed under the requisite conditions. He agrees that it may be true that this purely physical reaction may also account for the behaviour of Strongyloides and hookworm larvae. Lane (1933) states that his account of the behaviour of larvae in a stream was based on his own experiments and was not a criticism of Fülleborn's experiment. He reaffirms his belief that the phenomenon is adequately accounted for merely by the action of physical forces since even motionless larvae turn and head up-stream.

8. *Thermotaxy.*

Fülleborn (1932) discusses Lane's objections to this taxy and shows by photographs that both hookworm and Strongyloides larvae are directionally stimulated by heat and move over the surface of agar or through it towards the source of heat. Free-living nematodes, on the other hand, although showing increased activity on stimulation by heat, do not move towards the source of heat. He then considers the significance of thermotaxy in relation to skin penetration and thinks that it is of practical importance in this respect.

Lane (1933) discusses his former attitude to thermotaxy, namely activation by heat, and concludes that it will not account for all the observed phenomena. He recognizes the directive stimulus of heat on larvae on or in agar and concludes that it must act in the same way on larvae in water where their movements cannot be due merely to convection currents set up by heat. On the significance and importance of thermotaxy for skin penetration he is, however, still sceptical and points out that there are several well attested cases of infective larvae which are positively thermotactic but which are not skin penetrators. He cites the case of *Bunostomum phlebotomum* which, though positively thermotactic, failed to exhibit the response when thigmotaxy had already been induced by contact with a surface or with the edge of a drop. He concludes that thermotaxy is less effective as a directive influence than thigmotaxy and consequently is less important in relation to skin penetration.

9. *Phototaxis and other Taxies.*

Strongyloides larvae show no evidence of phototaxy. For Barytaxy, Tonotaxy and Electrotaxy, Fülleborn directs attention to his 1924 paper.

10. *The Technique of Larvae Investigations.*

Fülleborn gives particulars for the culturing of Strongyloides and hookworm larvae by the funnel method, etc., and the use of agar plates for experiments with larvae. *T. Goodey.*

HUDSON (Ellis H.) & YOUNG (Agnes L.). **Hookworm Disease in the Arab of the Middle Euphrates.**—*Ann. Trop. Med. & Parasit.* 1933. July 7. Vol. 27. No. 2. pp. 207–212.

Of the method of diagnosis it is written "most of the stools were examined by cultural or centrifugation methods." In 5,400 consecutive out-patients in Deir-ez-Zor hookworm infection was proved 109 times, four-fifths being males and most of them under 30 years. In children infection is believed to be undoubtedly heavy. The patients come from the middle Euphrates and its two tributaries in Syria; and 38 per cent. of 308 Arabs working on the Euphrates 60 miles east of Deir-ez-Zor were found infected, an indication for further investigation. This appears to be the first time that ankylostomiasis has been reported from this region where, with syphilis and amoebic dysentery, it constitutes a major problem. *C. L.*

CASTEX (Mariano R.) & GREENWAY (Daniel). La ancylostomiasis en la Provincia de Buenos Aires. [**Hookworm in Buenos Aires Province.**]—*Prensa Méd. Argentina.* 1932. Dec. 30. Vol. 19. No. 21. pp. 1284–1286.

Two cases are recorded and others are referred to, tending to show that in the Province of Buenos Aires (San Isidro, Olivos, Martinez, Villa Ballester and Moron are specifically mentioned) cases of indigenous hookworm infestation occur, and it is stated that the dangers of extension in the northern parts of the Province are considerable. The authors use this as a reason for calling the attention of the health authorities to the need for investigation to determine the actual prevalence of ankylostomiasis at least in that part of the Province. *H. H. S.*

GUNEWARDENE (Hugh O.). **The Cardiac Complications of Ankylostoma Infection with Special Reference to a Presystolic Murmur occurring in these Cases.**—*Jl. Trop. Med. & Hyg.* 1933. Feb. 15. Vol. 36. No. 4. pp. 49–53. With 5 figs.

These cases are reported from Ceylon by one who for about 7 years was clinical assistant, National Hospital for Diseases of the Heart. Five types of case are described. 1. Pregnant women with myocardial damage. 2. Cardiac failure with pulmonary congestion. 3. Anaemia and dyspnoea. 4. Hookworm infection with organic valvular disease. 5. Cardiac murmurs, systolic or presystolic with irregular pyrexia, all clearing up on disinfestation and blood improvement. 6. Any of the above in pregnant women.

"Heart disease due to ankylostoma infection might justly be called the "poor man's heart disease" of the tropics. In practice, in high society they are rare. For six years I have not seen one such case. Its frequency among the poor, and often the helpless poor, should be an incentive to further study, particularly in view of the fact that the sequelae of this infection can, as I hope I have shown, be easily mistaken for organic valvular disease and consequently labelled 'incurable.'" *C. L.*

LAMBERT (S. M.). **Hookworm Disease in the South Pacific. Ten Years of Tetrachlorides.**—*Jl. Amer. Med. Assoc.* 1933. Jan. 28. Vol. 100. No. 4. pp. 247–248.

"I report:—

"1. One hundred and fifty thousand consecutive mass treatments of hookworm disease with the tetrachlorides without a death.

"2. More than 100,000 consecutive treatments with carbon tetrachloride without a death and with few untoward symptoms.

"3. More than 46,000 treatments with tetrachlorethylene without a death and without untoward symptoms."

[Such is the author's trumpet call. We must not let it deafen us to certain quiet voices. For example BLACKIE's, in a death reported from Rhodesia (this *Bulletin*, Vol. 29, p. 314); ZIYA Bey's 1 death in 1,200 (HUSSAMEDDIN, *loc. cit.*, Vol. 29, p. 420); NAG's 3 deaths in 289 children (*loc. cit.*, Vol. 28, p. 179); and of less recent reports STRAUB's, 2 deaths in 400 Chinese and Klings (*loc. cit.*, Vol. 23, p. 479); KOUWENAAR's, 4 deaths (*loc. cit.*, Vol. 23, p. 479); BAIS's, 3 deaths in 15,000 (*loc. cit.*, Vol. 21, p. 582); the tragedy in Assam which grievously checked the hookworm campaign there; and others. The clarion note may have a very grave issue.] *C. L.*

MOLLOY (Daniel M.). **The Treatment of Hookworm and Other Intestinal Helminth Infections with Hexylresorcinol under Field Conditions in Central America. A Preliminary Report.**—*Southern Med. Jl.* 1933. July. Vol. 26. No. 7. pp. 575–582. [18 refs.]

"A total of 1,784 treatments of hexylresorcinol were administered during the course of our experiments. We observed no toxic symptoms from the drug. Slight gastric irritation occurred occasionally, but nausea was rare and vomiting did not occur.

"On account of the action of hexylresorcinol on the gelatin of capsules, the drug is best administered in sugar-coated pills.

"Full therapeutic (1·00 gram) doses of the drug removed from 65 to 72 per cent. of hookworms under field conditions. The efficacy of the drug is greatly lessened if it is not given on an empty stomach or if food is taken shortly after administration. Clearing the intestinal tract of extraneous matter by a preliminary purge would probably increase the efficiency of the drug and this would be a recommendable procedure in the treatment of individual cases.

"In the treatment of ascaris infections the drug is probably without an equal. From 93 to 98 per cent. of the ascarids harbored by the individuals treated were expelled by a single treatment.

"In the treatment of whipworm infestations the drug appears to be less effective than earlier reports indicated. It would, however, appear to be the most effective drug we have against this parasite at the present time. Only higuerolatix (the latex of the wild tropical fig, *Ficus laurifolia*) removes a larger percentage of the worms.

"The administration of a purge two hours after the drug lessens its anthelmintic effect. On account of its delayed action, phenolphthalein may be administered simultaneously with the drug without lessening its efficiency against hookworms and ascaris. If saline purgatives are employed, these should not be administered until several hours later, preferably the following morning.

"In the treatment of hookworm disease, a single dose of hexylresorcinol lessens the worm burden to the extent that the patient is relieved of most of the symptoms. It does not, however, entirely eliminate the danger to others, since the majority of individuals treated still harbor a sufficiently large number of worms to be considered 'carriers.' In treatment campaigns which are being conducted

for the purpose of reducing mass infection, a second treatment (preferably of some anthelmintic which possesses a more selective action against hookworm, tetrachlorethylene, carbon tetrachloride or thymol), would seem to be indicated." *C. L.*

BUCKLEY (J. J. C.). *Necator suillus* **as a Human Infection.** [Memoranda.]—*Brit. Med. Jl.* 1933. Apr. 22. pp. 699–700.

Eggs of adult necators, obtained by killing pigs in Port-of-Spain, were cultured in soil and sterilized pig's faeces. Eleven applications of infective larvae, averaging about 80 larvae each were made to the skin of the forearm of man between 29th July and early September; about 60 inflammatory lesions in all followed.

Eggs appeared 54 days after the first application and their passage continued for 4 months. Oil of chenopodium produced 1 male and 2 females. "Owing to the close resemblance between *N. suillus* and *N. americanus* such infections might easily be overlooked, for *N. suillus* is readily mistaken by naked eye examination alone for an incompletely grown *N. americanus*. Microscopical examination of all suspected specimens would be necessary in order to estimate the incidence of *N. suillus* in human beings." [The assumption underlying the acceptance by helminthologists of *N. suillus* as a morphological species seems to depend on reported differences of a grade which the anthropologist does not accept as sufficient to exclude the Hebrew, the "Aryan" or the Australian aborigine from the species *Homo sapiens*.] *C. L.*

MAPLESTONE (P. A.). **Creeping Eruption produced by Hookworm Larvae.**—*Indian Med. Gaz.* 1933. May. Vol. 68. No. 5. pp. 251–257. With 1 fig. [28 refs.]

By careful, controlled work it is shown that creeping eruption in man may be produced by infective larvae of *Ancylostoma braziliense*, *A. caninum*, *A. duodenale*, or *Necator americanus* each in pure culture; and while there is full appreciation of the work which has been done on this matter in the last few years, there is insistence of the debt owed to earlier writers and particularly to C. A. BENTLEY in 1902.

Purity of specific source was insured by using eggs either obtained by dissection of specifically identified female worms or from faeces shown by subsequent autopsy to contain eggs of one hookworm species only. The eggs were cultured in heated and helminth-free earth for 9 days, the infective larvae were extracted, a known number placed on a skin, and the excess of water taken up by sprinkling with powdered helminth-free earth. The attempt to separate ground itch from creeping eruption, or different types of creeping eruption from one another, is deprecated. Regarding the failure of workers to obtain evidence of intestinal infection after the application of larvae of *A. braziliense* to the human skin, Maplestone shows that such infection may in fact be acquired. The eggs are small measuring 0·053 mm. long in strong saline; they appear after about 5 weeks, 3 or 4 in a D.C.F. preparation; *A. braziliense* has been recovered after an anthelmintic and when this has not been given the eggs have spontaneously disappeared after a very few days. Maplestone is convinced that he would have missed the infections he discovered had he used any other method of stool examination. *C. L.*

McCarthy (Lee). **Creeping Eruption due to** *Ankylostoma braziliense.* —*Arch. Dermat. & Syph.* 1933. Mar. Vol. 27. No. 3. pp. 490–497. With 2 figs.

That the eruption was caused by a nematode larva was proved by microscopic sections of excised skin. That the larva was *A. braziliense* is mere inference from writings by Kirby-Smith, *et al.* Creeping began 3 months after the presumed date of infection. *C. L.*

Faust (Ernest Carroll) & Kagy (Edwin S.). **Experimental Studies on Human and Primate Species of Strongyloides. I. The Variability and Instability of Types.**—*Amer. Jl. Trop. Med.* 1933. Jan. Vol. 13. No. 1. pp. 47–65.

Summary and conclusions :—

" 1. This paper presents experimental evidence showing the behavior of strains of Strongyloides obtained from primate hosts and from human hosts.

" 2. Previous studies by the writer have demonstrated the different capacities of macaque, ateles and human strains of Strongyloides, to establish themselves in autochthonous and reciprocal hosts. This investigation presents evidence based on inoculation of man, the macaque and the dog with chimpanzee, macaque, capuchin and human strains.

" 3. Repeated passage of pure type human strains through canine hosts invariably produced alterations. These tended to simplify themselves into the direct type of development. Passage of the chimpanzee strain through dogs failed to modify it from the original indirect type, but in man the stability was reduced. The organism bred true to type in the macaque but after this passage was unable to develop in dogs.

" 4. Change from the hyperinfective and indirect types to the direct type was accompanied by a decrease in the virulence of the organism and increased failure to establish itself in the canine host. This is in direct contrast with the increased virulence and greater ease of establishing itself in the case of the unmodified chimpanzee strain during successive passages through dogs.

" 5. The data established by this investigation provide proof as to the instability and variability of the several strains of Strongyloides studied." *C. L.*

McCoy (O. R.), Miller (J. J.), Jr. & Friedlander (R. D.). **The Use of an Intradermal Test in the Diagnosis of Trichiniasis.**—*Jl. Immunology.* 1933. Jan. Vol. 24. No. 1. pp. 1–23.

" 1. Of 36 persons ill with trichiniasis (*i.e.*, two to six weeks after infection) 25 (70 per cent.) gave positive immediate skin reactions following intradermal injection with 0·1 cc. of a 1 : 10,000 dilution (in terms of dry weight of powder) of a saline extract of *Trichinella spiralis* larvae. An additional 8 reacted to a 1 : 500 dilution of the antigen making a total of 33, or 92 per cent. positive.

" 2. Of 39 persons tested from three to twenty-two months after infection, 19 (49 per cent.) reacted to the 1 : 10,000 dilution and an additional 12 were positive to a 1 : 500 dilution, a total of 31 or 80 per cent. positive.

" 3. Of 13 persons ill three and one-half to seven and one-half years prior to the test, 3 (23 per cent.) were positive to the 1 : 10,000 dilution,

and 5 more reacted to the 1 : 500 dilution, a total of 8 or 62 per cent. positive.

"4. One hundred and four control persons from Rochester, New York, showed an incidence of 9 per cent. positive with the 1 : 10,000 dilution and a total of 18 per cent. positive with both the 1 : 10,000 and 1 : 500 dilutions. Forty-seven control persons from San Francisco, California, showed an incidence of only 4 per cent. positive to the 1 : 10,000 antigen and 6·5 per cent. positive with both the 1 : 10,000 and 1 : 500 dilutions.

"5. Ninety-two persons from southern Louisiana infected with *Trichuris trichiura* showed an incidence of 18 per cent. positive with the 1 : 10,000 dilution and a total of 62 per cent. with both the 1 : 10,000 and 1 : 500 dilutions."

"From a practical standpoint the trichinella skin test cannot be considered a certain diagnostic test. It appears that a negative test will probably prove more useful in ruling out the diagnosis of trichiniasis than a positive one in establishing it. A positive test, however, definitely strengthens the evidence for the diagnosis and may justify further search for the parasite. Positive tests obtained with antigen dilutions of 1 : 10,000 or higher are of more definite diagnostic value than those obtained with lower dilutions. A year's experience in using the skin test in hospitals where trichiniasis not infrequently occurs leads the present authors to the conclusion that it may be a valuable aid in the diagnosis of the disease."

The reactions were immediate ones and were held positive when there was a wheal at least 7 mm. and an erythema at least 20 mm. in diameter. *C. L.*

HELLER (M.). Entwickelt sich die *Trichinella spiralis* in der Darmlichtung ihres Wirtes? [**Development of** *T. spiralis* **in the Gut Lumen of the Host?**]—*Ztschr. f. Parasitenk.* 1933. Feb. 16. Vol. 5. No. 2. pp. 370–392. With 8 figs. [31 refs.]

Experiments on rats and kittens led to the conclusion that trichinella larvae are freed from their cysts rapidly—as soon as the meat containing them is digested. They then immediately attach themselves to the mucosa of the small intestine, a prerequisite for their further development, and without it (as when enclosed in a collodion sac) there is commonly no development up to 96 hours. Within the mucosa, however, they become sexually mature in 24 hours, are fertile with embryonic development beginning in 48 hours, the embryos are complete in 66 to 78 hours, are hatched within the uterus, and are posited in 80 to 90 hours. Leaving the lumen of the small intestine they bore in 12 hours into the connective tissue of the villi on which they live and which they damage as they grow to maturity. The investigation seems to have been limited to the study of the intestine. *C. L.*

TRAWIŃSKI (A.) & MATERNOWSKA (I.). Ueber Invasionsfähigkeit junger Muskeltrichinen. [**Invasiveness of Young Muscle Trichinae.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. May 22. Vol. 128. No. 5/6. pp. 328–331.

Nineteen days after infection is the shortest time in which trichinae appear in muscle in a state of full development and infective possibility. Though not encapsuled, their own chitin carries them safely

through the stomach without digestion. The failure of younger larvae to infect a new host is due to lack of development and not to the effects of gastric juice. *C. L.*

DOERR (R.) & MENZI (Elsa). Studien ueber den Mechanismus der Trichinelleninfektion. VIII. Mitteilung: Vergleichende Untersuchungen ueber die Empfänglichkeit der Ratte und des Meerschweinchens für die Infektion per os. [**Susceptibility of Rat and Guineapig to Trichinella Infection per os.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Apr. 28. Vol. 128. No. 3/4. pp. 177–188. [10 refs.]

In the rat, feeding with 3 Trichinella larvae always produced infection, but feeding with two did not always do so, presumably because the chances of a pair were smaller with two only; in the guineapig, 8 larvae always failed, 10 to 40 generally failed, to infect, and larger numbers were not tried apparently. Within these limits, intensity of infection ran parallel with numbers of larvae eaten; with over 3,000 trichinella larvae both species became equally infected.

C. L.

PENSO (G.). Nouvelles considérations sur la biologie des oxyures. [**Biology of Oxyuris.**]—*Ann. Parasit. Humaine et Comparée.* 1933. July 1. Vol. 11. No. 4. pp. 268–270.

Penso brings forward, as confirmation of his view that oxyurids complete their life-cycle in one host [this *Bulletin*, Vol. 29, p. 765], a statement by WETZEL (1931) that in *Dermatoxys veligera* of the hare he has demonstrated larvae in the thickness of the mucosa. But while WETZEL believed that the larvae were entering the mucosa, Penso is satisfied that they were doing just the reverse, and that the cycle of evolution of this group of parasites is thus completely clarified and demonstrated. *C. L.*

BROWN (H. W.). **Treatment of Pin Worm** (*Enterobius vermicularis*) **Infestation with Hexylresorcinol.**—*Proc. Soc. Experim. Biol. & Med.* 1932. Nov. Vol. 30. No. 2. pp. 221–224.

"1. Hexylresorcinol is very active on *Enterobius vermicularis*, a 1–1,000 suspension killing them in 2 minutes. 2. Five out of 6 people treated with hexylresorcinol pills by mouth and enemas became free of their enterobius. Two out of 3 people treated by enema only became free of enterobius. Although this is not sufficient data to judge which method is the best, the life history of the worm indicates need of both oral and enema treatment. 3. Suggested outline of treatment. Treat twice a week in the morning as follows: (*a*) Omit breakfast; no food until noon. (*b*) Hexylresorcinol pills orally, 0·1 gm. per year of age up to 10 years of age, maximum dose after this age 1·0 gm. Drink plenty of water. (*c*) Soapsuds enema and after its evacuation an enema of 1 part crystalline hexylresorcinol in 1,000 cc. of water; this enema to be given high and retained 5 minutes. (*d*) Bed sheets to be boiled at least twice weekly to destroy eggs or worms passed on them." *C. L.*

LIENGME (A.). De l'appendice vermiforme à coprostase et de l'appendicite à oxyures. [**Appendicitis in Relation to Thread Worms.**]—*Arch. Internat. Méd. Expérim.* 1932. Dec. Vol. 7. No. 4. pp. 709–745. With 4 figs. & 5 plates. [172 refs.]

It is concluded that faecal stasis in the appendix originates in the foetus, that it favours the migration of *E. vermicularis* into the appendix, but that the worm does not produce appendicitis. *C. L.*

i. RODENWALDT (Ernst). *Microfilaria malayi* im Delta des Serajoe. I. [*Mf. malayi* **in Java : its Morphology.**]—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1933. Vol. 22. No. 1. pp. 44–54. With 1 folding map. [10 refs.]

ii. ——. Zur Morphologie von *Microfilaria malayi.*—*Ibid.* pp. 54–60. With 2 figs.

i. At this spot on the south coast of Java, the only microfilaria found was *Mf. malayi.* In places lying about highwater mark the percentage of blood infection was high (Boenton 41, Wlahar 29, Rawalo 33, Karangandri 24) ; on the edge of the delta the rate lies between 4 and 9, and 15 kilometres away falls to 0·66. Periodicity is nocturnal.

The relationship of microfilariae in the blood to elephantiasis was computed in two ways. Firstly, the percentage of embryo-carriers among those with elephantiasis was much smaller than in those without elephantiasis ; secondly, in localities where the incidence of embryo-carriers was high elephantiasis was high and *vice versa* ; in over 24,000 persons examined and arranged by localities this positive correlation was marked.

Development to the infective larval stage has been traced in *Taeniorhynchus annuliferus, T. uniformis, T. indianus,* and *Anopheles sinensis.* It can be excluded in *Culex bitaeniorhynchus, C. fatigans, C. vishnui, C. alis, C. withmorei, C. sinensis.*

ii. The anatomy of *Mf. malayi* as disclosed by vital staining (Azur II, 1 in 3,000) is described and pictured. The distinctive features are :—

The excretory cell, as in *Mf. loa,* lies 2 larva-breadths behind the excretory pore and not close to it as in *Mf. bancrofti,* and the pore opens on a papilla. The internal body is as it is in *Mf. bancrofti,* whereas it is of course absent in *Mf. loa.* Cell G1 lies close to its hinder end and not at an interval from it as in *Mf. bancrofti* ; it is large as in *Mf. loa* whereas in *Mf. bancrofti* it is much smaller. Cells G2 to G4 lie about midway between G1 and the anus and not nearer to the latter as in *Mf. bancrofti.* The tail is slender and variable, in contrast to the stiff tail of *Mf. bancrofti,* and it thins and thickens. The tail nuclei are looked on as artefacts.

C. L.

BRUG (S. L.) & DE ROOK (H.). Filariasis in Nederlandsch-Indië, IV. [**Filariasis in Dutch East Indies.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Feb. 28. Vol. 73. No. 5. pp. 264–279. With 2 graphs & 1 fig. English summary.

"A review is given of hitherto unpublished filaria-indexes and elephantiasis-indexes found in the Malay Archipelago. New material, received from New Guinea and from Melanesia contained exclusively *Mf. bancrofti. Filaria malayi* does not seem to spread further eastward than the Moluccas and the Lesser Sunda Islands."

The figures show that in Borneo of 1,039 adults examined 319 showed *Mf. malayi*, none *Mf. bancrofti*, the percentage of infected varying from 8 to 48. In Celebes of 246 examined percentages of infections lay between 57 and 67, all with *Mf. malayi*. In Kl. Soenda, Isle of Flores, and in Soemba the figures were mixed. In New Guinea 50 per cent. of 251 examined were infected, all with *Mf. bancrofti*.

"In North Ceram, where *F. bancrofti* occurs only very sporadically, a village to village investigation was made into the correlation between the occurrence of *F. malayi* and that of elephantiasis. In all 30 villages were investigated. A positive correlation ($0{\cdot}74 \pm 0{\cdot}08$) was found.

"Further research failed to confirm the thesis (BRUG, 1931) that the filaria malayi-index of patients with elephantiasis is greater than that of healthy people from the same region. In many areas the former was found to be inferior to the latter, just as has been observed repeatedly in bancrofti infected regions.

"Some observations were made on the development of *Mf. malayi* and *Mf. bancrofti* in mosquitos. *Mf. malayi* could be traced in *Mansonia* (*Mansonioides*) *uniformis* till the final mobile stage, but by lack of material the localization in the proboscis could not be seen. Normal development of this species until the seventh day was seen in *Anopheles bancrofti*. In *Anopheles parangensis* no development was seen.

"The development of *Mf. bancrofti* from Upper Digul River (New Guinea) in *Culex fatigans* was completed in two specimens only as against 11 ones that remained negative. *C. fatigans* has been very recently imported in the Upper Digul area; *F. bancrofti* has been carried for a very long time in this region by other mosquito species and possibly in this way it has lost its capacity for development in the former species." *C. L.*

FENG (Lan-Chou). **Household Mosquitoes and Human Filariasis in Amoy, South China.**—*Chinese Med. Jl.* 1933. Feb. Vol. 47. No. 2. pp. 168–178. With 12 figs. on 1 plate. [11 refs.]

"1. Observations on human filariasis and household mosquitoes made in July and August 1931 in Amoy are reported.

"2. Of 161 prisoners examined 22 were found infected with *Microfilaria bancrofti* and one with *M. malayi*. The findings do not represent the incidence of this infection of the local population because most of the prisoners found infected were not natives of Amoy. It is suggested that filariasis is probably not a very common disease in Amoy, the incidence being probably much lower than that in other parts of Fukien province.

"3. The case infected with *Microfilaria malayi* came from Wenchow, Chekiang. Blood smears obtained from Huchow of the same province also contained *M. malayi* but not *M. bancrofti*. It is suggested that filariasis due to *M. malayi* may be a common infection in this particular province.

"4. Of the fourteen species of mosquitoes caught *Culex fatigans*, *Armigeres obturbans*, *Aedes aegypti*, *Aedes albopictus* and *A. minimus* seem to be the commonest species found in houses at least in the period when the present observations were made.

"5. *Culex fatigans* was the only species of mosquito found infected with *M. bancrofti*. It seems possible, however, that *C. fatigans* is not such a good carrier as *A. hyrcanus* var. *sinensis* and the comparatively

small number of the latter may account for the low incidence of filariasis in Amoy.

"6. Six *A. minimus* were also found infected with microfilariae but the embryos had a quite different structure from those of *M. bancrofti*. The nature of these embryos is not determined." *C. L.*

IYENGAR (M. O. T.). **Filariasis in Trivandrum.**—*Indian Jl. Med. Res.* 1933. Apr. Vol. 20. No. 4. pp. 921–938. With 4 maps & 4 charts.

Trivandrum, the capital of Travancore State, lies on the western sea-coast of India. Iyengar's conclusions on his work are these :—

"1. Microfilariae observed in man in Trivandrum are those of *W. bancrofti*.

"2. The gross microfilaria rate of Trivandrum is 10·5 per cent. The flat low-lying area in the centre of the city has microfilaria rates of 15 to 20 per cent. The outskirts of the city have low infection rates.

"3. A combination of the microfilaria rate and the filarial morbidity rate is a better measure of filarial endemicity than either of the two data by themselves.

"4. The gross filarial morbidity rate is 33·1 per mille. The central areas of Trivandrum have high filariasis rates (over 70 per mille). The incidence of filariasis in the outlying areas is comparatively low. Elephantiasis of the limbs is the most common affection and constitutes 53 per cent. of the filarial affections.

"5. There is a high degree of positive correlation between the microfilaria rates and the filarial morbidity rates. Areas with a high microfilaria rate have a high incidence of filariasis, and vice versa.

"6. The chances of finding microfilariae in filarial subjects vary inversely as the duration and severity of the affection. Microfilariae are comparatively more frequent in early stages of filarial disease, such as lymphangitis, than in later stages, such as elephantiasis of the leg.

"7. The earliest age for the presence of microfilariae in peripheral blood as observed in Trivandrum is 2¼ years, for the occurrence of lymphangitis 8 years and for elephantiasis of the leg 11 years.

"8. There is a fair degree of positive correlation between the microfilaria rate and the average infestation (average number of microfilariae per positive film).

"9. Filariasis rate and filarial endemicity rate vary directly with age. The microfilaria rate also shows a rise with age but, after the 25th year, it is nearly at the same level.

"10. *Culex fatigans* is the transmitter of the infection in Trivandrum. The natural infection rate in *Culex fatigans* varies in the different sections of Trivandrum and bears a close relation to the extent of infection among the human population." *C. L.*

ACTON (Hugh W.) & RAO (S. Sundar). **The Pathology of Elephantiasis of Filarial Origin.**—*Indian Med. Gaz.* 1933. June. Vol. 68. No. 6. pp. 305–315. With 4 figs.

The authors' view is that while *Wuchereria bancrofti* is primarily responsible in all cases for lymphatic damage, the pathological conditions in a large number of advanced cases of elephantiasis are due to superimposed bacterial infection.

In dealing with lesions due to filarial toxin, they write: "The adult filarial worms live in the main lymphatics and in the hila of the glands draining the extremities. . . . In many instances, however, the adult worms and embryos are found lying on the distal side of an enlarged or fibrosed gland, so that the embryos are not able to reach the blood stream." "Hyperfilariation" [the authors do not employ the term] is instanced in a group of enlarged inguinal glands excised at operation containing many mature filariae; two of the 3 microphotographs illustrating this point show the intrauterine embryos extended, and the third ova apparently from a uterine section nearer the ovary. [It would have been interesting to know the hour of operation.] It is pointed out that although the microfilaria rate is a good practical guide for the incidence of filariasis in a population, the absence of embryos in the blood is no evidence that filariasis is absent; in the case just mentioned, for instance, there were no microfilariae in the blood. "When there is no obstruction and microfilariae are present in the blood, there is a constant high eosinophilia indicating the leakage of toxins into the peripheral blood. . . . Where there is partial obstruction the average eosinophilia shows a distinct decrease." In elephantiasis where the lymphatic obstruction is complete there is no indication of the toxin in the blood and the eosinophil count is practically normal. Under anaphylactic symptoms are cited cases with migraine, fever, and joint and muscle pains. Dermal tests, using as antigen adult guinea worms, embryos of *W. bancrofti*, and hydrocele fluid were not specific; using dirofilaria antigen prepared by Fairley's technique most cases showed positive reaction "but, surprisingly, a few cases of chyluria, heavily infected with microfilariae in the blood, showed no reaction at all."* It is shown that individual susceptibility of infected persons to lymphatic obstruction is most marked.

In lesions due to secondary infection it is held that in a large percentage of infected persons the worms prepare a nidus for bacterial infections. "Streptococci bring about acute attacks of lymphangitis, cellulitis or periadenitis producing elephantiasis." Of elephantiasis it is written that its first stage is that of static oedema due to the influence of filarial toxin on the tissue permeability, and in it periodically a pea-sized lump appears and travels slowly downwards before disappearing. "This small lump is an aberrant migrating parasite." Its second stage is that of blubbery tissue with recurrent lymphangitis and abscess which may be either helminthic or bacterial in origin. Its third is brought about by the addition of secondary infection of the skin usually from foci situated on the skin surface.

C. L.

LLOYD (R. B.) & CHANDRA (S. N.). **Complement-Fixation in Filariasis.** —*Indian Jl. Med. Res.* 1933. Apr. Vol. 20. No. 4. pp. 1197–1208.

Regarding the antigen used it has been obtained by two methods (1) a plain alcoholic extract of powdered dry *Dirofilaria immitis*,

*FAIRLEY in the first few cases used 0·25 cc. of a 1 per cent. extract as antigen, but owing to the severity of the local and general reactions noted, this was reduced to 1/10 this strength in all subsequent cases. Rao and Acton appear to have entirely overlooked this point in FAIRLEY's original paper. They employed 0·1 cc. of a 1 per cent. extract diluted with an equal volume of saline, and so presumably were employing twice the amount of immitis antigen advocated by FAIRLEY.—*N. H. F.*

(2) one derived from the acetone-insoluble lipoids of this worm by the process used by BORDET & RUELENS for syphilitic antigen. The authors add "we have been very satisfied with the results obtained by this latter antigen, which is undoubtedly to be preferred to the plain alcoholic extract." They conclude :—

"1. A series of eighty-nine cases of various clinical types of infection with *W. bancrofti* has been examined by the complement-fixation reaction, using as antigen extracts, variously prepared, of *D. immitis*. Twenty-three positive reactions were obtained. A series of fifteen cases of infection by other helminths was also similarly examined, yielding three positive reactions, all of which were in guinea-worm disease.

"2. It is shown that cases of acute or sub-acute lymphangitis tend to exhibit two distinct types of immunity response. In one type the finding is a positive complement-fixation reaction associated with an eosinophilia, the total white count and polymorphonuclear percentage being within normal limits. In the other type the finding is a negative complement-fixation reaction with a polymorphonuclear leucocytosis. We conclude, accordingly, that there are two distinct types of attack in such cases which we designate the toxic and septic types respectively.

"3. Repeated examination by the complement-fixation test of cases of acute or sub-acute lymphangitis with a positive complement-fixation reaction has demonstrated that as the attack passes off the reaction becomes negative.

"4. The positive complement-fixation reaction, in whatever type of filarial lesion it may be found, is always associated with an eosinophilia, and, so far as we can see at present, the disappearance of the positive complement-fixation reaction does not seem to affect the eosinophilia, though this point requires further examination.

"5. As a result of various considerations, we have suggested that the preliminary immunity response in infection by *W. bancrofti* is anaphylaxis plus an eosinophilia, and that in circumstances favourable to large releases of filarial toxin the positive complement-fixation reaction is superadded as a further stage of immunization, the clinical result of the increased toxin releases being an 'attack' in types of obstruction where the toxin releases are normally small, such as in blockage of the limb lymphatics, but no attack in circumstances where the lymphatics are still freely open as in chyluria.

"6. Two cases are referred to showing the effect upon the positive complement-fixation reaction of surgical treatment of the antigenic factor.

"7. Of four cases of guinea-worm disease three reacted positively, and the positive reaction remained unchanged for long periods. The long duration of the positive reaction is probably due to the absence of lymphatic obstruction, bringing our findings in guinea-worm disease into line with Fairley's findings in *L. loa* and our own findings in chyluria. As in chyluria, eosinophilia was present in the one case of guinea-worm disease which yielded a negative complement-fixation reaction as well as in those which reacted positively. Adequate facilities for the study of guinea-worm disease are not available in Calcutta, but it is suggested that examination of this test will probably not only lead to a valuable means of diagnosis of guinea-worm disease, but will also provide important immunological data which may be applicable to the more complex case of infection with *W. bancrofti*.

" 8. From Fairley's results in *L. loa* and our own in guinea-worm disease it seems likely that the complement-fixation test by means of Dirofilaria extracts is a group reaction for the worms of the filarial family generally.

" 9. As the clinical manifestations of *W. bancrofti* infection are largely those of lymphatic obstruction whereby the antigenic factor is to a progressive extent cut off from the circulation, no serological test could be expected to diagnose all types and stages of the disease, but in a somewhat restricted field the test seems likely to be useful in diagnosis.

" 10. So far as examined, the specificity of the test seems quite satisfactory. Apart from guinea-worm disease, no positive reactions were obtained in other helminthic diseases, except in two cases of hookworm infection, in both of which *W. bancrofti* infection was also present.

" 11. As we have no method at present of combating the filarial toxin directly, the demonstration that some attacks of lymphangitis are of purely toxic origin is not of immediate therapeutic value, except in so far as it suggests that probably no benefit is to be looked for from vaccine treatment in this type of attack." *C. L.*

ASHFORD (B. K.) & SNYDER (H. McC.). **Gentian Violet in Filariasis.** —*Puerto Rico Jl. of Public Health & Trop. Med.* 1933. June. Vol. 8. No. 4. pp. 375–384. [Spanish version pp. 385–390.]

The authors' findings compared with those of Ashford in 1902–3 " bear out the frequently expressed opinion of medical men and lay men " that filariasis and elephantiasis have since then declined in frequency and severity in Porto Rico.

Treatment by gentian violet was given to 13 of 18 men found harbouring microfilariae, the other 5 serving as controls. The dosage was 0·065 gm. 3 times a day in enteric coated pills. The average number of red corpuscles of the 18 was 5,491,000 with variations between 4,016,000 and 8,784,000, and haemoglobin varied between 73 and 103. Microfilariae were counted between 8.30 and 9.30 p.m. for 7 nights before and 14 to 22 nights after treatment began. There was no disappearance of microfilariae from the blood but it may, it is believed, have caused a diminution in their numbers in 11 of the 13.

C. L.

MAYEOZOKO (S.). Ueber Fälle von geheilter Haematochylurie und Chylurie, sowie ueber kleine Experimente betreff der Widerstandsfähigkeit der Larven von *Filaria bancrofti* gegen Arzneimittel und Hitze. [**Resistance of Larvae of** *F. bancrofti* **to Drugs and to Heat.**]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. Mar. Vol. 32. No. 3 (336). [In Japanese. German summary p. 32.]

It is concluded in the German summary that antimonal, potassium picrate, quinine hydrochloride, trypaflavin, neoneoarsemin and potassium iodide damage microfilariae little, but that mixtures of them are most fatal. Heated to 40–43°C. larvae die in an hour, to 48°C. in 10 minutes.

C. L.

i. LOW (G. Carmichael) & MANSON-BAHR (P. H.). **Some Recent Observations on Filarial Periodicity. With a Clinical and Laboratory Report by** A. H. WALTERS.—*Lancet.* 1933. Mar. 4. pp. 466–468. With 5 figs.

ii. MURGATROYD (F.). **Filarial Periodicity.** [Correspondence.]—*Ibid.* 1933. Mar. 18. p. 610.

iii. LANE (Clayton). **Mechanical Basis of Periodicity in** *Wuchereria bancrofti* **Infection.**—*Ibid.* Aug. 19. pp. 399–404. [20 refs.]

Probably the best way of bringing order out of chaos and putting before readers the conflict of opinion relative to the vexed question of so-called filarial periodicity—really the periodicity of appearance of filarial embryos in the peripheral circulation—will be to deal with the above papers in order of their publication (see also this *Bulletin*, Vol. 26, p. 981).

i. In the first, Drs. Low and Manson-Bahr take for their text the case of an Indian steward under observation for 11 years at the Seamen's Hospital, Royal Albert Dock. Their main contention against Clayton LANE's theory of " periodic cyclic parturition " of the female filaria is that, with a daily destruction of all the embryos, absorption of so much dead material would produce considerable reaction in the human body, analogous to protein shock, which, in fact, does not occur. Logically, of course, this is a *non sequitur* ; it is no valid argument against cyclical parturition *per se* to say that destruction of the results of that parturition should produce certain symptoms.

Hourly examinations of the blood of the patient referred to above showed :—

" (*a*) The periodicity curve is absolutely nocturnal but embryos are present in small numbers in the peripheral circulation during the daytime. This fact has often been noted before.

" (*b*) The evening rise of the embryo filariae swarm is more gradual in character than the matutinal fall. The maximum migration of embryos occurs at 2 a.m.

" (*c*) The number of embryo filariae and the character of the curve remains remarkably constant when taken on three distinct occasions, separated by a month or more of time—viz., June 4th, August 29th, and Sept. 2nd, 1932.

" (*d*) The number of embryo filariae at the hour of midnight remains approximately the same in 1932 as it was in 1924, a period of eight years."

These facts, they maintain, support the idea that the sleeping and waking states are primary factors in the phenomenon of periodicity. It would indeed be of the greatest interest if similar tests were made on the non-periodic variety of the infestation in the Pacific, for, they say, " How can a daily cyclical destruction of embryos explain the phenomenon of non-periodic filaria ? " They believe that the embryos select the large vessels of the thorax as their city of refuge and that the outflow passes into the peripheral blood.

Blood was taken from the patient referred to and a quantity containing approximately 139,000 embryos injected into the heart of each of two guineapigs. There was no resulting distress, and no embryos were detected in repeated examinations of the peripheral blood. [The authors quote as a statement of Dr. Mortimer GRANVILLE one which he did not make. The statement really occurs in Sir Patrick MANSON's book on " the Filaria Sanguinis Hominis," 1883, p. 57, and is in reference to a letter from Dr. GRANVILLE which appeared in the *Lancet* the year before.]

ii. Dr. Murgatroyd in a letter referring to the above paper reports on the results, or absence of positive results, from injecting a man with citrated human blood containing 720,000 embryos. Four examinations of the peripheral blood in the succeeding 21 hours did not discover any embryos.

iii. Colonel Clayton Lane in his longer article takes the opportunity of the paper by Drs. Low and Manson-Bahr to put his points more fully. He quotes Sir Patrick Manson to show that the latter, after deliberation, rejected the hypothesis of periodic parturition. F. W. O'Connor had found, from operations or autopsies on seven persons suffering from filariasis, that all the living female worms in the same body showed the same stage of the developmental cycle. Also that parturition took place about mid-day, the females being crammed with embryos before noon and collapsed and empty about 2 p.m. Now, if this daily birth of large numbers of embryos occurs and, as the paper above shows, the numbers in the peripheral blood are fairly stable, the number produced [not necessarily the *ones* produced] must be removed daily and destroyed.

O'Connor's studies showed that though there might be embryos in the afferent vessels and the peripheral parts of the lymphatic glands, he could see none in the efferent vessels. It is most improbable, therefore, that they habitually traverse the healthy glands. Hanschell's experiments (injection into the guineapigs' hearts) and that of Murgatroyd (into the circulation of a volunteer) indicate that filarial embryos entering the blood stream are rapidly removed from it and do not return to it. How, or by what organ they are removed, has yet to be determined.

The objection that death of large numbers of embryos would produce symptoms (analogous, for example, to protein shock) Lane meets by saying that if a corresponding number of embryos were injected into a man of 60 kilos as was injected into the guineapigs, they would amount to 5 million embryos and 400 cc. of heterogenous blood ; nevertheless the animals showed no symptoms. Moreover, Lane has never maintained that there was daily cyclical destruction, but that the number produced at the daily cyclical parturition was removed (and destroyed) in the 24 hours, though this need not be completed even in that time. Against harbourage in the great vessels and lungs he remarks that the embryos are seen to drift on a slide with any little current and it is unreasonable to suppose that they could resist the torrent in the heart and aorta " being unceasingly buffeted by projectiles about as wide as their bodies." [Clayton Lane quotes the paragraph attributed by Low and Manson-Bahr to Mortimer Granville and assigns it rightly to Manson, but gives as reference a letter from Sir Patrick in which this does not occur, instead of the book in which it does.]

He explains the lag of 12 hours or so between the parturition of the filaria and the appearance of embryos in the blood by a study of the changes found in the lymphatic system in filariasis. The afferent vessels to a gland are a favourite habitat of the worms and by endothelial proliferation these vessels become blocked. Details of some glands containing plasma cells (those with remains of embryos) and others with neither plasma cells nor embryos need not detain us ; the upshot is that filariae, adult and embryonic, stop the lymph flow which can be re-established only by canalization or collateral channel development. Sections seem to show that under obstructive pressure channels of capillary size are mechanically opened out in the walls of the lymph

vessels; these acquire an endothelium and anastomose and embryos may be forced into them. It is suggested that the slow drift through these tortuous by-paths accounts for the delay between mid-day parturition and mid-night appearance of embryos in the peripheral circulation. [One would think that the entrance would be more evenly distributed, rather than limited to a few hours of the night, but it may be that with the simultaneous parturition of all the females, all the embryos that do reach the blood have an equally difficult road to travel and arrive about the same time.]

What may be the nature of the stimulus to the rhythmical phenomenon of simultaneous and cyclical parturition has yet to be sought; when this is discovered we may hope to find, by its absence or modification, the reason for the non-periodicity in the Pacific *W. bancrofti.*

H. H. S.

RAO (S. Sundar). **The Duration of the Life of the Embryos of** *Wuchereria bancrofti* **in the Human System.**—*Indian Med. Gaz.* 1933. Jan. Vol. 68. No. 1. pp. 3–6. With 3 figs. [13 refs.]

The life span of *Mf. bancrofti* outside and within the body is considered. At 4°C. and in aseptic conditions microfilariae were kept alive for 4 to 6 weeks. As regards their life in the host two cases are reported.

In one, in whom a cyst just below the elbow was excised, "embryos disappeared completely between the second and third month after the cyst was excised" and were still absent 2½ years later. In the second, repeated examinations of the blood showed no microfilariae but he had a cyst in each axilla and had actually been admitted to hospital for scrotal lymphangitis followed by abscess. The cysts which contained on puncture a few microfilariae were removed under local anaesthesia, one on 22nd July, the second on 4th August. On the latter date microfilariae were first found in the blood. Finger blood (100 cmm.) was taken daily at midnight for 68 days from 6th August. Counts varied from 4 to 0, the latter on 37 of the 68 days. They were not found for 37 days after 12th October. "In both cases there is definite evidence of the cyst being the location of the adult worms and the sole source of embryos in the blood." So, confident in this last conclusion, for which evidence is not, nor without minute post-mortem examination could be, offered, it is inferred that the duration of life of embryos in the human body is about 70 days.

C. L.

ROMITI (Cesare). Contributo alla migliore conoscenza del ciclo biologico della "Filaria Bancrofti Cobb." nell'uomo. (Nota preliminare.) [**The Biological Cycle of** *F. bancrofti* **in Man.**]—Reprinted from *Monitore Zoologico Italiano.* 1932. Vol. 43. No. 6. pp. 167–170. With 1 fig.

Romiti makes these confident statements regarding persons who have *Mf. bancrofti* in the blood. (1) When the spermatic cord on one side is extirpated there is a marked diminution at the end of the first week of the number of microfilariae circulating in night blood. (2) When both cords are removed all microfilariae disappear from the blood within two weeks. He concludes that the cord is the habitat of the fertile adults in most cases, and that the life of microfilariae is relatively short.

C. L.

MACKERRAS (I. M.). **Metamorphosis of *Filaria bancrofti* Cobbold.** [Correspondence.]—*Brit. Med. Jl.* 1933. July 1. p. 36.

A question of priority is felt to be at issue here.

MANSON-BAHR has written "The actual time-cycle development of the filaria in the mosquito was worked out first by Dr. Carmichael Low in 1900 on material sent to Manson by Thomas Bancroft" [*Brit. Med. Jl.*, 1933, Vol. 1, p. 304]. Mackerras points out that what delayed discovery of the full cycle in the mosquito by MANSON, LEWIS and others was the conviction that mosquitoes fed once only, and having laid their eggs died. BANCROFT & ROSS realized independently that this was untrue, and the former wrote "It never dawned on me that my mosquitoes were dying from starvation." As soon as Bancroft discovered how to keep them alive for considerable periods, the rest of the work was comparatively simple, and at a meeting of the Royal Society of New South Wales on June 7th, 1889, he described and figured the various stages of larval development in the mosquito, giving the time of development as 16 to 35 days, according to season, and writing in an addendum :—

"It has occurred to me that the young filariae may gain entrance to the human host whilst mosquitos bearing them are in the act of biting. The entrance of warm blood into the mosquito may excite the young larvae, in consequence of which they . . . pass down the proboscis into the human skin."

C. L.

ROMITI (Cesare). **Report and Considerations on the Cystoscopic Examination and Ureteral Catheterisation in Four Cases of Chyluria, Observed in British Guiana.**—*Brit. Guiana Med. Ann. for 1932.* pp. 74–83.

These four cases were women and are the only cases of chyluria seen by Romiti in British Guiana during 8 years, in which time he has performed 843 operations on men for filarial manifestations.

In all 4 cases there was cystoscopy and ureteral catheterization. In one there was no history or sign of filariasis, but chyluria had persisted interruptedly for 20, continuously for 10, years; urine from the ureters was clear, chyle came from dilated mucosal lymphatics spread over an area about 3 cm. in diameter in the bladder immediately above the opening of the left ureter. In a second case with like bladder lesions and clear ureteral urine there was proved filariasis (microfilariae, which were found in no other case, and waxed kernels as enlarged femoral glands are locally called, fever, "rose," and elephantiasis subsiding with rest). In the other two cases the chyle came from one ureter only and the quantity of fluid from the affected side was 2 to 4 times as great as from the healthy. In 2 cases laparotomy for other reasons revealed dilation of the uterine and utero-ovarian lymphatic plexus and of none other, and all the cases suggest that the dilatation of the lymphatic vessels which causes the condition may occur over a very limited area only.

C. L.

MCCOY (O. R.). **The Occurrence of *Microfilaria ozzardi* in Panama.**—*Amer. Jl. Trop. Med.* 1933. May. Vol. 13. No. 3. pp. 297–310. With 1 fig. & 4 plates. [12 refs.]

"1. *Microfilaria ozzardi* was found in the blood of 44·5 per cent. of 119 Indians examined in the Tuira River basin, Darien Province, Panama.

"2. The infection rate in native villages in the same region varied from 2 to 57 per cent. and averaged 9·9 per cent. in the 244 natives examined.

"3. A few cases of infection with *M. ozzardi* were found in the Chagres River valley, Panama, but all of these were recent arrivals from the Atrato River valley, Colombia.

"4. No evidence was found that *M. ozzardi* is pathogenic or in any way a significant problem of public health importance.

"5. Southeastern Panama is an endemic center of infection with *M. ozzardi* heretofore unknown in the geographical distribution of the parasite." *C. L.*

CHAMBON. Présence de microfilaires dans le liquide céphalo-rachidien d'un trypanosomé avancé. [**Microfilariae in the Cerebrospinal Fluid of a Patient with Advanced Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1933. Apr. 5. Vol. 26. No. 4. pp. 613–614.

In a man suffering from sleeping sickness, lumbar puncture revealed active *Mf. perstans* in the withdrawn fluid. Red corpuscles were so few that it is concluded that they had come from the cerebrospinal fluid itself, presumably as the result of damage inflicted on the meninges by trypanosomes. *C. L.*

GREIG (E. D. W.). **Notes on Cases of Calabar Swellings** (*Loa loa* **Infection**).—*Jl. Trop. Med. & Hyg.* 1933. June 15. Vol. 36. No. 12. pp. 169–170.

Greig reports 7 cases of Calabar swelling. Naturally they do not lend themselves to abstraction. Some interesting points are mentioned.

In one, eosinophilia varied between 5·2 and 46 during 4 months' observation. In another, the woman said she could see the worm or part of it in her eye, but nothing was present in the visible part of the eye on dilatation with cocaine and homatropine. In a third, a doctor at Dagema failed to extract a loa but thought he had killed it. A cyst formed at the spot adherent to the outer and lower quadrant of the right sclerotic and illumination showed a coiled slender white thread which excision of the cyst showed to be a nematode. In a fourth, appearance of any Calabar swelling was preceded 10 to 24 hours earlier by pricking in the skin, insistent enough to prevent sleep. Two complement-fixations were carried out by Hamilton FAIRLEY, one positive one negative, the unusual feature of the latter being that microfilariae were present in the blood. *C. L.*

VAN SLYPE (W.). Essai de chrysothérapie des filarioses. Effet eutrophique de l'or. [**Gold Therapy in Filariasis.**]—*Ann. Soc. Belge de Méd. Trop.* 1933. Mar. 31. Vol. 13. No. 1. pp. 87–91.

On 6 persons infected with *Dipetalonema perstans* or *Loa loa*, alone or combined, van Slype has tested two gold-containing organic compounds—solganal intravenously or solganal B intramuscularly—following these up with fuadine intramuscularly. No permanent vermicidal action was evident.

In all cases there was great diminution or even complete disappearance of microfilariae from the blood, and in this connexion great stress is laid on the method of examination, for thin or thick films may show no embryos when triple centrifuging displays them; but in all cases microfilariae reappeared in full activity after treatment

ceased. Yet there was in general an improvement in numbers of red corpuscles and in weight, which it was felt could not be explained by hospital feeding. *C. L.*

GOUGEROT & BLUM (Paul). Un cas de "filaria loa" guéri par des injections sous-cutanées de sulfarsénol. [**Case of Loa Infection which recovered after Injections of Sulfarsenol.**]—*Bull. Soc. Française Dermat. et Syph.* 1932. Jan. Vol. 39. No. 1. pp. 154–155.

After pointing out the varying results which have followed arsenical treatment of filariases, the authors recount a case of cure.

A forester, 40 years old, was incapacitated from work by Calabar swellings and painful tumours of 10 months' duration. After two treatments with sulpharsenol, the first totalling 0·48 gm., the second 1·08 gm., oedema and cysts completely disappeared, and cure persisted 6 months later. *C. L.*

GALLIARD (H.). L'éosinophilie sanguine au cours des filarioses chez les indigènes du Gabon. [**Eosinophilia in Filariasis in Natives of Gabun.**]—*Le Sang.* 1933. Vol. 7. No. 7. pp. 711–715.

There is a certain parallelism between eosinophilia in the native inhabitants and the average degree of infection with loa (see Table); although the confusing presence of hookworms is noted, and individual differences may be great.

	Percentages of		
	Mf. perstans	*Mf. loa*	Eosinophilia
Children to 5	10	0	11
,, 5 to 15	51	5·7	31
Adults	47·5	15·4	48
Aged	20	·0	30

Eosinophilia is more closely connected with intensity of clinical signs than with presence of microfilariae, though the highest number of eosinophils occurred in one who had never suffered from symptoms, and though their numbers may vary greatly in persons placed in apparently identical conditions of likelihood of infection. *C. L.*

NEUMANN (Hans). Ein Fall von Gelenkerkrankung (Coxitis rechts) bei *Filaria loa.* [**Hip Joint Affection in a Case of Loiasis.**]—*Deut. Ztschr. Chir.* 1932. Vol. 237. No. 4–5–6. pp. 331–342. [19 refs.]

A man of 28 was in the Cameroons from 1912 to 1916 and there suffered from malaria, blackwater fever twice, beriberi, gonorrhoea and filariasis as evidenced by Calabar swellings and appearance of Loa in the eyelids. Wassermann positive, Tuberculin tests negative. Eosinophilia up to 20 per cent. An abscess pointed beside the spermatic cord, and the hip joint was found to be involved. A worm crossed the lid, was extracted

and proved to be a Loa. Six days later one crossed the popliteal space, and *Mf. loa* was then found in the blood, apparently for the first time. Drug treatment consisted in 36 very painful intramuscular injections of solution of "20 thymol + 20 oleum olivarum." The abscess closed and microfilaria were no longer found in the blood. *C. L.*

HISSETTE (J.). Mémoire sur l'*Onchocerca volvulus* "Leuckart" et ses manifestations oculaires au Congo Belge. [**Onchocerciasis and its Ocular Manifestations in Belgian Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1932. Dec. 30. Vol. 12. No. 4. pp. 433–529. With 29 figs. [7 pages of refs.]

This long, detailed and important paper appears definitely to eliminate *O. caecutiens* as an entity different from *O. volvulus*.

It is pointed out that anatomical differences between the two forms are so slight that they are in fact indistinguishable. In certain regions in the Belgian Congo where onchocerciasis was formerly unknown it is now rampant, with grave ocular complications in as many as 50 per cent. of the population; and the clinical symptoms of these, the pathological lesions and the distribution of microfilariae in the eye are just those which have been reported for "*O. caecutiens.*" A very grave view is taken of the ocular complications, it being held that there is a slow, inexorable progress towards blindness; they are not necessarily associated with nodules on the head. Thus a Table of 20 cases is given, all with ocular symptoms, all positive to the diagnostic technique the writer advises (namely the teasing out in normal saline of a fragment of snipped-off bulbar conjunctiva, which in fact showed microfilariae varying in number from 1 to 32), and none with nodules on the head but with 2 to 23 on shoulders and chest. In treatment excision of obvious cysts leaves behind those more deeply situated and has not checked the trouble. Drug treatment is being investigated.

In prophylaxis the recommendation is a completely forest-clear space round villages of 500 metres and the covering up of the body when working in spots where simulium prevails, of whose connexion with the illness the indigenes are themselves convinced. The photographs illustrate microfilariae in choroid, ciliary body, iris, sclerotic, episclera and conjunctiva and the lesions they produce in them; as well as men blinded and partially blinded individually and in mass, and nodules and lesions in the skin. *C. L.*

JOHNSTONE (Herbert G.) & LARSEN (Albert E.). **Onchocercosis in North America.**—*California & Western Med.* 1933. May. Vol. 38. No. 5. pp. 361–364. With 3 figs.

"This disease may seem a medical curiosity to physicians of the temperate zone since it has no immediate attendant public health problems, but we should become acquainted with it for the following reasons: (1) Clinical manifestations of Onchocercosis resemble many conditions of the temperate zone. (2) The Eusimulium fly is widespread in certain localities throughout the western States. (3) The disease has shown a definite tendency toward a northern migration. (4) The numerous Mexican immigrants in the United States provide an opportunity for the presence of a carrier of *Onchocerca caecutiens*.

This may lead subsequently to the contamination of our own simuliid species. If this occurs, a case of the disease is sure to make its appearance sooner or later ; and, once present, it is difficult to eradicate."

C. L.

BAUVALLET (H.). A propos de la dracunculose chez les noirs d'Afrique. [**Dracunculosis in African Natives.**]—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 444–446.

The loss of working efficiency induced by dracunculosis in French West Africa is indicated by the fact that 7 per cent. of recruits are immobilized by it, the average duration of treatment being 23 days, with limits of 73 and 11. If compactly and conveniently coiled, worms may with advantage be excised. In one case 7 worms were removed from the lower limbs and one from the thoracic wall within 4 months.

C. L.

MORARD. Au sujet de la draconculose à Bilma. [**Dracunculosis at Bilma, Niger Colony.**]—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 535–536.

Although imported wholesale into Bilma in the Niger Colony dracunculosis is not endemic there. *C. L.*

CHITWOOD (B. G.). **Does the Guinea-Worm occur in North America ?** —*Jl. Amer. Med. Assoc.* 1933. Mar. 18. Vol. 100. No. 11. pp. 802–804. [14 refs.]

The answer is " Yes " for animals, " No " for man. For animals apart from BENBROOK's find in the silver fox in Iowa, Chitwood has found the worm in the raccoon (*Procyon lotor*) from Ontario and New York and in the mink (*Putorius vison*) from Nebraska, 4 cases in all. Of the 10 cases reported from man, four are genuine and must from their histories have been contracted elsewhere. Of the other 6 cases, BARKAN's (1876) was probably Loa, and JARVIS's (1857) probably a foreign body, WALKER's (1857) and VANHARLINGEN's probably creeping eruption, LEIDY's (1850–51*bis*) *Filaria hominis-oris* probably gongylonema and not the male of *D. medinensis* as LEIDY alternatively suggested. The freedom of man from infection in North America is attributed to his habits there. *C. L.*

BENBROOK (E. A.). *Dracunculus medinensis* (**Linnaeus, 1758**) **appears in the United States as a Parasite of the Fox.**—*Jl. Amer. Vet. Med. Assoc.* 1932. Dec. Vol. 81. No. 6. pp. 821–824. With 2 figs.

Identification was by B. G. CHITWOOD of the Bureau of Animal Industry, U.S. Department of Agriculture and is substantiated by photographs. The worms occurred in a year-old silver-black vixen (*Vulpes fulva*) whelped and raised on a farm, the fox pens on gravelly soil being floored with sand, and with no water except raised drinking pans. The food was meat scraps with occasional vegetables, bananas and other fruit. None of the other foxes was affected. *C. L.*

HOFFMAN (W. A.). **Gapeworm Infestation of Man.**—*Bol. Asoc. Med. de Puerto Rico.* 1932. Dec. Vol. 24. No. 207. pp. 703–704.

Within 18 months Hoffman [this *Bulletin*, Vol. 29, p. 72] has added to the record another case of infection with *Syngamus laryngeus* in man.

This woman teacher had been so affected with cough and fever as to have her work interfered with. Study by GUTIERREZ-IGARAVIDEZ showed that she had bronchiectasis, but tuberculosis was held to be excluded. She finally expelled a pair of worms with bloody mucus during a violent fit of coughing. Although there were minor morphological differences SCHWARTZ confirmed the identification. *C. L.*

PROMMAS (Chalerm) & DAENGSVANG (Svasti). **Preliminary Report of a Study on the Life-Cycle of** *Gnathostoma spinigerum.*—*Jl. Parasitology.* 1933. June. Vol. 19. No. 4. pp. 287–292. With 4 figs. [12 refs.]

In Cyclops, hatched larvae of *G. spinigerum* undergo development to a stage possessing the essential distinctive anatomical features of the adult.

Eggs were separated from faeces by McCOY's method (this *Bulletin*, Vol. 27, p. 426). After lying in water from 10 to 20 days active loosely sheathed embryos hatched, but died if left in water. Fed to white rats and to larvae of *Ctenocephalus canis* and *C. felis* no development occurred. When placed in water with cyclops specimens, which random sampling showed to be free from helminthic infection, they were swallowed, pierced the gastric wall and developed in the body cavity reaching in 14 days 0·372 mm. long by 0·062 mm. wide. They had by then a cephalic bulb with 2 lips and 4 rows of pointed spines, oesophagus and intestine, a set of cells in the middle third which is probably a germinal body and 4 transparent contractile cervical sacs "connected with the mouth." The larva then becomes motionless save for slight movement of the head, but is stimulated *in vitro* by 0·4 per cent. hydrochloric acid. Experiments regarding transmission to the definitive host will be undertaken. *C. L.*

STRICKLAND (C.) & ROY (D. N.). **The Rôle of Chaetopods (Segmented Worms) in their Relation to Man.**—*Indian Med. Gaz.* 1933. Mar. Vol. 68. No. 3. pp. 159–160.

"We may conclude by asserting the vastly greater importance of these worms to man from the economic point of view rather than the medical. The comparatively few medical cases that have been reported may be grouped into two classes, firstly those of interest to the psychiatrist, and secondly those to the surgeon or gynaecologist, these being probably all due to contamination of the water in the use of man, the worms adapting themselves to such diverse situations as the vagina, nasopharynx and intestine." *C. L.*

AMELIO (Fortunato). Contributo di osservazioni cliniche, per una più esatta conoscenza del tipo di anemia degli individui affetti da anchilostomiasi.—*Giorn. Ital. di Malat. Esot. e Trop.* 1933. Mar. 31. Vol. 6. No. 3. pp. 57–60, 63–6, 69–72.

ANDERSON (T. Farnworth). A Case of Acute Intestinal Obstruction due to Ascaris.—*East African Med. Jl.* 1933. Mar. Vol. 9. No. 12. p. 367.

BACIGALUPO (J.). Superposition géographique de *Fasciola hepatica* L. et de *Limnaea viatrix* d'Orb.—*C. R. Soc. Biol.* 1933. Feb. 10. Vol. 112. No. 5. pp. 492–493.

BEIJNEN (G. I. W. Koolemans). Een gecombineerde worminfectie van den darm.—*Nederl. Tijdschr. v. Geneesk.* 1933. June 3. Vol. 77. No. 22. pp. 2477–2485.

BHALERAO (G. D.). A Note on the Probability of Infection of Man and Domestic Carnivores by *Isoparorchis hypselobagri* (Billet, 1898).—*Indian Jl. Vet. Sci. & Animal Husbandry.* 1932. Dec. Vol. 2. Pt. 4. pp. 406–407. With 1 fig.

BRÜNAUER (Stefan R.). *Trichocephalus dispar* und Neurodermitis.—*Wien. Klin. Woch.* 1933. June 30. Vol. 46. No. 26. pp. 812–814. With 1 fig. [17 refs.]

DE BUEN (Eliseo), DE LA CAMARA (Pedro) & JUAREZ (Ernesto). Estudio de un foco de anquilostomiasis en un tejar del término municipal de Oropesa (Toledo).—*Rev. San. e Hig. Pública.* 1932. Nov. Vol. 7. No. 11. pp. 1062–1083. With 2 figs. [32 refs.]

CAWSTON (F. G.). The Frequency of Liver Changes in Schistosomiasis.—*Jl. Trop. Med. & Hyg.* 1933. Apr. 1. Vol. 36. No. 7. pp. 98–99.

CRUZ (Walter Oswaldo). Therapeutica da ankylostomose.—*Hospital.* Rio de Janeiro. 1933. June. Vol. 5. No. 6. pp. 471–476. With 4 figs.

DE LA CÁMARA (Pedro) & ACOSTA CAMPS (Leopoldo). Una encuesta epidemiológica sobre anquilostomiasis en tejares de las provincias de Cáceres y Toledo.—*Rev. San. e Hig. Pública.* 1932. Dec. Vol. 7. No. 12. pp. 1161–1170.

EMANUEL (J.). Iets over bilharzia op de Boven-windsche eilanden (West-Indië).—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Feb. 28. Vol. 73. No. 5. pp. 286–288. With 1 plate.

GIUNTA (Giuseppe). Profilassi contro l'uncinariasi in Somalia.—*Ann. di Med. Nav. e Colon.* 1933. Mar.–Apr. 39th Year. Vol. 1. No. 3–4. pp. 174–182.

KHOURI (Joseph). Contribution à l'étude de la toxémie hépatorénale dans la bilharziose chronique.—*Premier Congrés Internat. d'Hyg. Méditerranéenne, Marseille, 20–25 Septembre 1932.* 3 pp. [10 refs.]

KNOTT (James I.) & RICE (Justus B.). Elephantiasis of the Scrotum. Operative Technique.—Reprinted from *Amer. Jl. Surgery.* 1932. Apr. N.S. Vol. 16. No. 1. pp. 78–80. With 5 figs.

LÜDTKE (H.) Vergleichende Untersuchungen ueber das Ol. Chenopodii und sein wirksames Prinzip, das Askaridol.—*Med. Klin.* 1933. Apr. 28. Vol. 29. No. 18 (1481). pp. 611–613.

MARTINEZ GONZÁLEZ (M.). La anquilostomiasis en las minas de Puertollano.—*Rev. San. e Hig. Pública.* 1933. Jan. Vol. 8. No. 1. pp. 23–48. With 9 figs.

NIÑO (Flavio L.) & DEFAZIO (Francisco). La cuestión de las apendicitis verminosas.—*Bol. Inst. Clin. Quirúrg.* Buenos Aires. 1932. Vol. 8. No. 67. pp. 119–135. With 10 figs. [20 refs.]

NIÑO (Flavio L.) & DEFAZIO (Francisco). La cuestión de las apendicitis verminosas.—*Semana Méd.* 1933. Apr. 6. Vol. 40. No. 14 (2047). pp. 1166–1176. With 10 figs. [20 refs.]

POLICARO (R. D.). Sopra un caso di bilharziosi vescicale.—*Riforma Med.* 1933. Mar. 25. Vol. 49. No. 12. pp. 439–442. With 1 fig.

ROMERO CALATAYUD (Antonio). El parasitismo intestinal por vermes en sus relaciones con la infeccion tuberculosa.—*Medicina Países Cálidos.* Madrid. 1933. Jan. & Mar. Vol. 6. Nos. 1 & 2. pp. 27–50; 104–132. [56 refs.]

SMORODINZEW (I. A.), BEBESCHIN (K. W.) & PAWLOWA (P. I.). Beiträge zur Chemie der Helminthen. I. Mitteilung: Die chemische Zusammensetzung von *Taenia saginata.*—*Biochem. Ztschr.* 1933. May 20. Vol. 261. No. 1–3. pp. 176–178.

SUÁREZ (Jenaro). Elephantiasis Tropicum.—*Puerto Rico Jl. of Public Health & Trop. Med.* 1933. Mar. Vol. 8. No. 3. pp. 287–292. With 4 figs. (3 on 2 plates). [Spanish version pp. 293–298.]

TAREEFF (E.), OSHEROVA (F.) & RASKIN (A.). [Clinical Aspects of Trichinellosis.]—*Med. Parasit. & Parasitic Dis.* Moscow. 1932. Vol. 1. No. 1. pp. 45–49. [In Russian.]

TIMPANO (P.). Di alcune rare complicazioni dell'anchilostomiasi.—*Policlinico.* Sez. Prat. 1933. May 22. Vol. 40. No. 21. pp. 818–820.

UJLAKI (P.). Een geval van Askariden-asthma met Colica mucosa.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. June 6. Vol. 73. No. 12. pp. 758–760.

VATTUONE (A. B.). A New Intradermal Reaction in Ankylostomiasis.—*Med. Jl. Australia.* 1933. May 27. 20th Year. Vol. 1. No. 21. pp. 645–647.

WALTHARD (B.). Zur Lehre der Askarideninfektion im Säuglings- und Kindesalter.—*Schweiz. Med. Woch.* 1933. May 6. No. 18. pp. 420–424. [11 refs.]

YELLOW FEVER.

LLOYD (Wray) & PENNA (H. A.). **The Preservation of Yellow Fever Immune Sera.**—*Amer. Jl. Trop. Med.* 1933. May. Vol. 13. No. 3. pp. 291–295.

Yellow fever immune serum was dried by collecting it in suitable tubes or containers and then freezing it in a mixture of 95 per cent. alcohol and carbon dioxide snow.

The tubes are rotated whilst the serum is freezing so that a thin layer of the frozen serum is formed inside. The tubes are then placed inside a sulphuric acid desiccator, packed in salt ice for at least two hours before use, and the air exhausted from the desiccator by means of a high vacuum pump. The tubes are removed after 24 hours and sealed, when the pale yellow serum will be found to be easily converted into a fine powder by a little shaking. When needed for use the ampoule is opened and sufficient distilled water added to make up the volume lost by desiccation. A series of titrations in mice with three samples of immune sera, both fresh and desiccated, shows that there was no appreciable reduction in the " immune protecting antibody " content of dried sera after storage at refrigerator temperatures for a period of five months. *E. Hindle.*

THEILER (Max). **A Yellow Fever Protection Test in Mice by Intracerebral Injection.**—*Ann. Trop. Med. & Parasit.* 1933. Apr. 10. Vol. 27. No. 1. pp. 57–77.

The author has elaborated a simple intracerebral test in mice for determining quantitatively the amount of protective antibodies in yellow fever immune serum.

The serum under investigation was mixed with an equal volume of a 1/10,000 dilution of mouse brain virus, and 0·03 cc. amounts were injected intracerebrally into six mice. All of six sera from persons who had been infected with yellow fever 53 or more years before bleeding showed definite protection. The virus suspension was prepared by grinding up an infected mouse brain with saline or distilled water containing 10 per cent. human or monkey serum. The mixture was then centrifuged at 2,500 revolutions a minute for half an hour and the supernatant fluid used for the tests. This fluid contained from 100,000 to more than 2,000,000 minimum lethal doses per cc. When this test was repeated using a 1/1,000 dilution of virus and serum in three concentrations, undiluted, 1/10 and 1/100, there was a falling off in the number of mice surviving when the 1/100 dilution of serum was used and in some instances even with the 1/10 dilution.

Experiments with filtered frozen and dried virus preparations were then made and it was found that the minimum lethal dose of these preparations varied very considerably, for in one the concentration fell from 1/20,000 and 1/200,000 to 1/800 after 389 days, whilst in another the end point started at 1/40,000 to 1/160,000 and after 394 days storage was 1/20,000. The author confirms SAWYER & LLOYD's observation [see this *Bulletin*, Vol. 29, p. 198] that different strains of mice show various degrees of susceptibility to yellow fever virus. Four strains of mice were injected with various dilutions of the virus and the percentages of mice which died were respectively 24·5, 63·0, 62·4 and 66·7 per cent. Age and diet were found to have no effect on this susceptibility.

It is shown that when each mouse received 32 minimum lethal doses in 0·03 cc. amounts, out of 120 control mice only 2 were alive 10 days after inoculation, whilst in a series of protection experiments in which the virus was mixed with immune sera, in every case all, or all but one, of 6 mice inoculated were alive on the tenth day. For accurate work it is recommended that 12 mice should be used for each test. The limitations in the methods of preserving virus render the use of frozen material unsuitable for the routine testing of sera by this method.

The great importance of the diluent is emphasized for, as is well known, the virus deteriorates rapidly in normal saline. Although the addition of 10 per cent. serum prevents this, different sera vary considerably in their suitability for use in this capacity. Many ascitic and pleuritic fluids were found to be quite satisfactory as diluents, also a 2·5 per cent. solution of egg albumen in distilled water.

E. H.

LAIGRET (J.). Recherches expérimentales sur la fièvre jaune. (Deuxième mémoire.) I.—Réactions observées chez l'homme, consécutivement à l'inoculation du virus de souris. II.—Atténuation de ce virus par vieillissement à la température ordinaire ; conservation du virus atténué. [**Experimental Studies on Yellow Fever. i. Reactions in Man following Inoculation of Mouse Virus. ii. Attenuation of Virus with Age ; Preservation of Attenuated Virus.**]—*Arch. Inst. Pasteur de Tunis.* 1933. Apr. Vol. 21. No. 3. pp. 412–430. With 3 charts.

i. Seven subjects were inoculated with 1 cc. of a 1/10,000 suspension of mouse brain infected with neurotropic yellow fever virus after 143 passages in mice, and three of them showed marked reactions after an incubation period of 13 to 15 days. In one, only febrile symptoms developed ; but in the other two, there was a slight albuminuria, jaundice, marked nervous symptoms, and haemorrhagic expectorations. The blood of these subjects collected during the febrile period was inoculated into a rhesus monkey, and also into guineapigs, and intracerebrally into mice with uniformly negative results. Uncertain results were obtained in rats, mice, and guineapigs with the haemorrhagic sputum. In addition, the cerebrospinal fluid of two of the patients was inoculated into mice without any effect. The protective power of the serum of all seven against yellow fever was found to be very slow in developing, being either feeble or absent on the 13th day, but all were protective on the 29th to 32nd days. In discussing this problem the author considers that the virulence of the virus is not absolutely fixed in mice, and has augmented in the course of successive passages, for the results obtained previously in the vaccination of human cases with a virus, after slightly fewer passages in mice, differ from the results of the present series [see this *Bulletin*, Vol. 29, p. 572].

ii. It is found that the brains of mice infected with yellow fever if kept at 10–20°C. gradually lose their virulence in the same way as spinal cords infected with rabies exposed to desiccation. The virulence had generally disappeared after 3 to 5 days at ordinary temperatures but at any stage the loss in virulence could be arrested by freezing the infected brain material, preferably in the form of a glycerin suspension. The inoculation of such attenuated virus into mice caused the development of immunity without any signs of infection.

[These results suggest that the use of neurotropic mouse virus for vaccination is not entirely without risk.] *E. H.*

LAIGRET (J.). La vaccination contre la fièvre jaune. [**Vaccination against Yellow Fever.**]—*Bull. Soc. Path. Exot.* 1933. June 14. Vol. 26 No. 6. pp. 806–814.

A general discussion of the subject, with special reference to the use of neurotropic mouse virus without immune serum. *E. H.*

STEFANOPOULO (Georges J.). Vaccination antiamaril. [**Vaccination against Yellow Fever.**]—*Presse Méd.* 1933. June 24. Vol. 41. No. 50. pp. 1016–1017.

A good general account of the subject with special reference to the author's use of horse yellow fever antiserum for the neutralization of neurotropic mouse virus.

It is found that horse antiserum can be substituted for human convalescent serum in the proportion of 1 : 5 in the method of vaccination elaborated by SAWYER, KITCHEN & LLOYD, in which the injection of a mixture of neurotropic mouse virus and human immune serum is accompanied by separate injections of additional human serum to make up the amount required for protection. This result overcomes the objection to the general use of this method for the vaccination of human subjects, since there were great difficulties in obtaining sufficient quantities of human convalescent serum. *E. H.*

ARAGÃO (Henrique de Beaurepaire). Emploi de virus vivant dans la vaccination contre la fièvre jaune. [**The Use of Living Virus in Vaccination against Yellow Fever.**]—*C. R. Soc. Biol.* 1933. Apr. 27. Vol. 112. No. 14. pp. 1471–1473.

The author recalls his earlier work showing that it was necessary to use living virus in order to obtain a good vaccination against yellow fever. Details are given of five human cases vaccinated with neurotropic mouse virus and immune serum.

One of these subjects showed a slight rise in temperature accompanied by malaise on the 7th and 8th days ; and the blood contained yellow fever virus which was passaged in mice. The reinoculation of virus increased the protective value of the serum threefold in the case of one person and was not followed by any reaction. Using a neurotropic virus after 200 passages in mice, two rhesus monkeys were infected by inoculation and both died of the disease. Their blood was infective to mice and also to mosquitoes. Some of these insects, 10 days after feeding on these monkeys, were ground up and inoculated into a normal rhesus, which died with typical lesions of yellow fever. Consequently the author is opposed to the use of virus alone for vaccination, but recommends that a preliminary injection of 3 cc. of human immune serum should be given, followed 6 hours later by the inoculation of a mixture of 2 cc. of immune serum and 0·001 gm. of mouse brain virus. [The amount of immune serum used by the author, a total of 5 cc., is far below the quantity recommended by SAWYER, KITCHEN & LLOYD—0·3 cc. to 0·5 cc. per kilo body weight. It is evident that the smaller doses of immune serum are insufficient to ensure the absence of virus from the circulation.]

E. H.

FINDLAY (G. M.). Sur l'immunisation contre la fièvre jaune. [**Immunization against Yellow Fever.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. June. Vol. 25. No. 6. pp. 1009–1014.

The author has vaccinated 25 persons against yellow fever, using the method elaborated by SAWYER, KITCHEN & LLOYD. The immune serum was obtained either from recovered cases of the disease or from recently vaccinated subjects. Wassermann tests were made on all sera and in addition protection tests in mice, no serum being used with an antibody titre of less than 1 : 256. Before use the sera were passed through a Seitz filter and received the addition of 0·2 per cent. tricresol dissolved in ether. All sera were tested for sterility by aerobic and anaerobic culture for one week at 37°C.

With immune serum of titres from 1 : 256 to 1 : 512 a dose of 0·5 cc. per kilo body weight was used, but with more active sera the dose was reduced to 0·3 cc. per kilo. The serum was inoculated subcutaneously into three or four places in the abdomen, and 4 to 6 hours later the vaccine was inoculated subcutaneously into the arm. The vaccine was prepared in the usual manner by drying a mixture of infected mouse brain and human immune serum, and dissolving it in distilled water before use.

The injections were usually followed by a general reaction 28 to 34 hours later, of the 25 cases 20 showed more or less fever, and in 5 the temperature was above 39°C. Common symptoms were headache, generally frontal or post-orbital, and most patients had a sensation of chilliness.

One patient, whose symptoms are described in detail, showed a much more severe reaction, including the appearance of red cells in the urine. It is difficult to explain the symptoms of this case, for no yellow fever virus could be found in the circulation, and later there was a satisfactory titre of immune bodies. In 3 cases examined for immunity on the 10th day after vaccination the titre was 1 : 8, whilst in 14 cases examined after 2 to 4 weeks the titre ranged from 1 : 128 to 1 : 512. The sera of 4 subjects 5 to 7 months after vaccination showed titres of 1 : 128 to 1 : 512.

In order to reduce the amount of immune serum necessary for protection the author has made experiments with monkeys and finds that the intradermal inoculation of 1 cc. of immune serum followed one hour later by an intradermal injection of virus in the same region, is followed by the development of a high degree of immunity without the appearance of virus in the blood. In collaboration with Dr. J. C. BROOM efforts are being made to obtain the virus free from foreign proteins by the use of graded collodion filters. *E. H.*

PARIS EGUILAZ (H.). El peligro de la fiebre amarilla en los territorios españoles del Golfo de Guinea. [**Risk of Yellow Fever in the Spanish Territories of the Gulf of Guinea.**]—*Medicina Países Cálidos.* Madrid. 1933. May. Vol. 6. No. 3. pp. 196–201. [11 refs.]

——. La fiebre amarilla en Fernando Póo.—*Rev. San. e Hig. Pública.* 1933. July. Vol. 8. No. 7. pp. 72–75.

The author discusses in somewhat general terms the application of tests for determining endemic regions of yellow fever, by taking samples of blood of the inhabitants, especially of children under 10 years of age, if there is grave suspicion that the disease exists in the

area in question, and injecting the serum with virus intracerebrally into mice. He then proceeds to consider reasons for applying these tests in Fernando Po.

He states that during 1931 several suspicious cases were observed and Fernando Po is exceptionally liable to importation of the virus by both sea and land routes, vigilance being particularly called for on the north and east. "The diffusion of Aedes mosquitoes and the facility with which the virus can be imported from neighbouring territories where yellow fever is endemic constitute a real danger of outbreaks in Fernando Po." *H. H. S.*

LLOYD (Wray) & PENNA (H. A.). **Yellow Fever Virus Encephalitis in South American Monkeys.**—*Amer. Jl. Trop. Med.* 1933. May. Vol. 13. No. 3. pp. 243–264. With 2 figs. [13 refs.]

Neurotropic yellow fever virus contained in Berkefeld N filtrates of infectious brain material was inoculated intracerebrally into various species of South American monkeys. A typical encephalitis was produced in *Saimiri sciureus*, *Ateleus paniscus* and *A. variegatus*, *Cebus frontatus*, *Callithrix albicollis* and *Callithrix* sp. and in these species the virus could be maintained by intracerebral inoculation for a number of passages and also transferred back to mice. In the case of *Leontocebus ursulus* intracerebral inoculation was followed in some instances by a febrile reaction with neurological symptoms and death, but no success was obtained in a limited attempt to transfer the virus in series in this species. *E. H.*

STEFANOPOULO (G.) & WASSERMANN (R.). Sensibilité du cobaye au virus neurotrope de la fièvre jaune. [**The Susceptibility of the Guineapig to Neurotropic Yellow Fever Virus.**]—*Bull. Soc. Path. Exot.* 1933. Apr. 5. Vol. 26. No. 4. pp. 557–559.

Guineapigs inoculated intracerebrally with a neurotropic virus after 174 passages in mice, succumbed to a myelo-encephalitis after 6 to 13 days. The infection was transmitted for three passages in guineapigs and at the second passage mice were also infected in order to prove the nature of the disease. These results clearly indicate the susceptibility of guineapigs to this method of infection.* *E. H.*

COWDRY (E. V.). **The Microincineration of Intranuclear Inclusions in Yellow Fever.**—*Amer. Jl. Path.* 1933. Mar. Vol. 9. No. 2. pp. 149–164. With 2 plates. [24 refs.]

The method of microincineration consists of incinerating microscopic sections after suitable fixation, and studying the mineral ash left deposited on the slide.

The author has applied this method to the liver cells of normal monkeys and others infected with yellow fever. The alterations in the size and shape of the nuclei and in the basophilic chromatin and in the nucleolus can be followed in the incinerated specimens from their mineral ash almost as clearly as in stained preparations, but the

*In the summary of STEFANOPOULO's paper on the inoculation of *M. rhesus* with mouse yellow fever virus (*ante*, p. 354), for "16 passages in mice" in line 2 "161 passages in mice" should be read. The error was in the original paper (letter from Dr. Stefanopoulo).

characteristic intranuclear inclusions give little or no ash. They differ, therefore, in this respect from the intranuclear inclusions occurring in guineapigs infected with submaxillary virus. *E. H.*

STEFANOPOULO (G.). Sur le "diounde," à propos d'une enquête épidémiologique sur la fièvre jaune dans les pays de Ségou et de Macina (Soudan Français). [**"Dioundé," Epidemiological Inquiry into Yellow Fever in Ségou and Macina (French Sudan).**]—*Bull. Soc. Path. Exot.* 1933. Apr. 5. Vol. 26. No. 4. pp. 560–562. [11 refs.]

Diounde is the name given to an obscure disease occurring most frequently in the neighbourhood of Socolo about 60 miles N.W. of Macina. It affects all ages and generally occurs during the great heat of August and September. The disease in its clinical features is not unlike yellow fever, for it begins with a high fever accompanied by headache, especially occipital and orbital, and also pain in the legs. Loss of appetite and nausea are customary and vomiting is frequent. The temperature falls after 2 or 3 days but after a short apyrexia rises again. On the 5th or 6th day appear a slight jaundice of the conjunctiva which may increase in intensity. Some patients show glandular swelling. Usually the symptoms disappear between the 15th and 20th days, but convalescence is long and painful.

The author tested the sera of five patients that had recovered from this disease against *Spirochaeta autumnalis* A, *S. hebdomadis* and *S. icterohaemorrhagiae*, but no agglutination was obtained. In addition he made serum protection tests in mice with yellow fever virus, also with negative results. The nature of this disease, therefore, remains obscure. *E. H.*

ZUCCARINI (J. A.) & DEL PONTE (E.). **Yellow Fever in Eastern Bolivia and the Hygienic Preventive Measures adopted in Northern Argentina.**—*Folia Biol.* Buenos Aires. 1933. Feb., Mar. & Apr. Nos. 23–24–25. pp. 116–118. [Spanish version pp. 111–116.]

The existence of yellow fever at Santa Cruz de la Sierra in Eastern Bolivia in 1932 was confirmed by three commissions, one Bolivian and two Argentine, both by histopathological diagnosis of the liver material and serologically. In order to guard against the introduction of yellow fever across the frontier, the Argentine Republic has had an entomological study carried out in Northern Argentina. The Aëdes index was found to be very high in spite of the winter season, consequently a policy of "larvarial foci" has been established in the district. Hitherto no case of yellow fever has been found in the Argentine Republic, the three cases recorded last year having been wrongly diagnosed. *E. H.*

JOSEPH (Gaston). La lutte anti-stégomyienne à Dakar. [**The Anti-Stegomyia Campaign at Dakar.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. June. Vol. 25. No. 6. pp. 1021–1023.

During 1931, a total of 744 breeding places in Dakar have been destroyed, 181 being out of doors and the remaining 563 inside houses. These figures indicate the necessity of visits to houses in any anti-mosquito campaign of this nature. It is found that where running

water is supplied Stegomyia tends to disappear; consequently every encouragement should be given to the extension of this system to all parts of the town. *E. H.*

BOYÉ. Les cas européens de fièvre jaune en Afrique Occidentale Française pendant l'année 1932. [**European Cases of Yellow Fever in French West Africa in 1932.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. June. Vol. 25. No. 6. pp. 1015–1020. With 2 maps.

A useful summary of the European cases of yellow fever in French West Africa during 1932, accompanied by two maps, one showing the distribution of these cases, and the other the results of protection tests obtained by STEFANOPOULO during his expedition of 1931–1932. A total of 42 cases with 37 deaths is recorded, all except two occurring in the Senegal, French Sudan and Guinea, whilst single cases occurred in Dahomey and the Upper Volta respectively. It is emphasized that these include only undoubted cases of the disease, all those being excluded in which there was any question of the diagnosis.

It is noted that there were 12 females and 30 males amongst the 42 cases, whilst the proportion of females among Europeans is only 1 in 25. It is suggested that the greater surface of the body exposed to the attacks of mosquitoes is responsible for the proportionately higher number of cases among women. *E.H.*

ARAGÃO (Henrique de Beaurepaire). Vaccinação contra a febre amarella—(Estado actual da questão).—*Brasil-Medico.* 1932. June 25. Vol. 46. No. 26. pp. 573–574.

BAUER (J. H.) & KERR (J. A.). Una enfermedad pirética confundida con la fiebre amarilla en la costa del Atlántico de Colombia.—*Bol. Oficina Sanitaria Panamericana.* 1933. July. Vol. 12. No. 7. pp. 696–715.

PAULI (P.). La febbre gialla. Rivista sintetica.—*Sperimentale.* 1932. Jan. 27. Vol. 86. No. 5–6. pp. 623–644. With 10 figs. on 3 plates. [48 refs.]

RELAPSING FEVER.

PALMER (J. H.) & CRAWFORD (D. J. M.). **Relapsing Fever in North America, with Report of an Outbreak in British Columbia.**—*Canadian Med. Assoc. Jl.* 1933. June. Vol. 28. No. 6. pp. 643–647. With 2 text figs. [16 refs.]

After reviewing the cases of relapsing fever that have been reported in North America, the authors give details of six cases of the disease occurring in the West Kootenay district of British Columbia where it seems to be endemic.

Spirochaetes were found in the blood of two of these patients. The wood tick *Dermacentor andersoni* Stiles, the commonest tick attacking man in this district, is considered the most probable vector, as bugs and lice are definitely excluded. [This is the first record of relapsing fever in Canada.] *E. Hindle.*

LEGGE (Robert T.). **Relapsing Fever : a New Etiological Observation : with Case Report of a Field Worker.**—*California & Western Med.* 1933. May. Vol. 38. No. 5. pp. 370–371.

An interesting record of a case of spirochaetal relapsing fever in Sierra County, California. The patient, a medical entomologist, was infected by the contamination of a wound with the blood of a freshly killed tamarack squirrel, which was subsequently found to contain spirochaetes by examination of blood smears and subinoculation into mice.

The patient developed a typical attack of relapsing fever, with spirochaetes in his blood, which also produced spirochaetosis when inoculated into mice. These results show that in California field rodents are victims of spirochaetosis which may be conveyed to man. The only tick found on these animals was a species of *Ixodes* and the natural vector of the disease remains uncertain. *E. H.*

NICOLLE (Charles), LAIGRET (J.) & SICARD (M.). Sur deux nouveaux cas de fièvre récurrente hispano-africaine observés en Tunisie (Cap Bon). [**Two New Cases of Spanish-African Relapsing Fever observed in Tunis.**]—*Arch. Inst. Pasteur de Tunis.* 1933. Apr. Vol. 21. No. 3. pp. 401–411. With 4 graphs & 1 map.

Two new cases of this relapsing fever have been found in Tunis, and in the case of one of the patients a study of the spirochaete in various laboratory animals, and especially its high pathogenicity for guineapigs, showed that it was allied to *S. hispanica*, Sadi de Buen.

The spirochaete was readily transmitted by *Ornithodorus erraticus* infected in the nymphal stage, and also survived 19 days in the louse. Ornithodorus collected in the neighbourhoods where the infected patients lived showed no signs of infection, nor has *S. hispanica* been found in five lots of *O. erraticus* comprising 148 individuals. It is noted that all the five cases of relapsing fever observed in Tunis

have been found in the course of routine examinations of slides during anti-malarial campaigns, and it is likely that more cases will be found when these inquiries are extended. *E. H.*

PAVLOVSKIĬ (E. N.). [*Ornithodorus lahorensis* und das Verhältniss desselben zur Uebertragung des Zecken-Recurrens.] [**Transmission of Relapsing Fever in Turkmenistan by Ornithodorus Species.**]—*Murgabsk. Parazit. Eksped. 1930 Akad. Nauk SSSR i Narkomzdr. Turkm.* in *Trud. Sov. Izuch. proizvod. Sil,* Ser. Turkmen., 1932. Pt. 2. pp. 79–100. With 2 figs. Leningrad, Acad. Sci. [In Russian.] [Summarized in *Rev. Applied Entom.* 1933. May. Vol. 21. Ser. B. Pt. 5. p. 97.]

"In view of the lack of proof that *Ornithodorus lahorensis*, Neum., is a vector of relapsing fever, though this has been suggested, transmission experiments with it were carried out in Turkmenistan in the summer of 1930. This tick is widely distributed in Central Asia, but in Turkmenistan has only been found in the town of Ashkhabad, where nymphs were collected on camels that had arrived from Persia. The individuals used in the experiments originated from Persia, eastern Uzbekistan and Armenia. They were fed on guineapigs infected with Central Asiatic relapsing fever (*Spirochaeta sogdiana*) and then on healthy ones, but in no case were the latter infected, though the disease was readily transmitted to them by *O. papillipes*, Bir. When placed on man, *O. lahorensis* did not bite. Only 9 per cent. of the ticks emitted coxal fluid when biting. Injections of emulsions of salivary glands and malpighian tubes of ticks that had fed on infected guineapigs 23 days previously did not produce infection, but positive results were secured with an emulsion of the stomachs.

"From these investigations the author concludes that the only proved vector of the tick-borne relapsing fever of Central Asia is *O. papillipes*." *A. G. B.*

BLANC (Georges), NOURY (M.) & FISCHER (M.). Le rat gris "Mus norvegicus" réservoir de virus de la fièvre récurrente hispano-africaine. [**The Grey Rat "*Mus norvegicus*" as a Reservoir of the Virus of Spanish-African Relapsing Fever.**]—*Bull. Acad. Méd.* 1933. Apr. 25. 97th Year. 3rd Ser. Vol. 109. No. 16. pp. 587–591. With 3 charts.

The authors have examined the rats caught at Casablanca in order to see whether they were infected with relapsing fever. Each day for several days, the brains of 10 rats were ground up and inoculated into guineapigs and 7 out of 16 of these animals subsequently became infected with relapsing fever.

In one instance 4 specimens of *Mus rattus* had been included but all the others comprised only *Mus norvegicus*. These results indicate that at least 1 rat in 22 is infected, but reasons are given for considering the percentage of infected rats as considerably higher. It is evident, therefore, that at Casablanca the grey rat is an important reservoir of the local relapsing fever transmitted by *Ornithodorus marocanus*.

E. H.

STERNBERG (E. J.) & PINES (A. I.). Zum Problem der direkten und indirekten Wirkung in der Chemotherapie. V. Zur Therapie des Rückfallfiebers mit Antimonderivaten bei verschiedenen Tieren und beim Menschen. [**The Problem of Direct and Indirect Action in Chemotherapy. V. The Treatment of Relapsing Fever in Various Animals and Man with Antimony Compounds.**]—*Klin. Woch.* 1933. May 27. Vol. 12. No. 21. pp. 825–828. With 2 charts.

The authors studied the effect of treatment with an antimony-compound—Stibosan H471—on infection with *Spirochaeta usbekistanica* in mice, guineapigs and rabbits, as well as in man.

The results showed that in every case the infection was cured and the animals completely sterilized as far as this spirochaete was concerned. The authors consider that in this instance the results are opposed to the view that the therapeutic agent acts indirectly through the tissues of the host, since the same result was obtained in different animals infected with the same spirochaete. [W. "Jork" should read W. Yorke.] *E. H.*

HINDLE (E.) & ELFORD (W. J.). **The Filtration of Spirochaetes through Graded Collodion Membranes.**—*Jl. Path. & Bact.* 1933. July. Vol. 37. No. 1. pp. 9–16. [22 refs.]

The authors have re-examined the problem of the filterability of spirochaetes using graded collodion filters of known porosity in order to determine the limiting porosity of various strains, and also whether there was any evidence of the existence of an ultra-microscopic stage in their development.

The results show that the water leptospira *S. biflexa,* and the pathogenic *S. icterohaemorrhagiae* have limiting porosities of 0·25 μ and *S. pallida* a limit of approximately 0·40 μ. This is interpreted as indicating a diameter of 0·1 μ for the former and 0·20 μ for the latter. The corresponding figures obtained from photographs using the ultraviolet darkground method were approximately 0·11 μ and 0·33 μ. The spirochaetes passed readily through the membranes and this method furnishes a simple and effective means of separating spirochaetes, including *S. pallida,* from other organisms.

No evidence was obtained of the existence of any special filterable phase, significantly smaller than the diameter of the spirochaete.

E. H.

CHORINE (V.). La séroflocculation de Henry dans la spirochétose des poules. [**Henry's Serum-Flocculation in Fowl Spirochaetosis.**]—*C. R. Soc. Biol.* 1933. Apr. 1. Vol. 112. No. 12. pp. 1164–1165.

This reaction is found to be positive in fowls infected with spirochaetosis. The flocculation begins to show with the sera of fowls 5–6 days after the febrile attack and persists for 30–50 days in recovered birds. This disease is accompanied by marked degeneration of the red cells. *E. H.*

LEPTOSPIROSIS.

SOUCHARD. Contribution à l'étude de la fièvre ictérohémorragique en Cochinchine. Recherche du spirochéta-ictérohémorrhagiae chez les rats de Saigon. [**Study of Spirochaetal Jaundice in Cochin China.** *S. icterohaemorrhagiae* **in the Rats of Saigon.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1933. Jan.–Feb. Vol. 11. No. 1. pp. 11–15.

By inoculating guineapigs with the organs of wild rats (*Mus decumanus*) caught in Saigon, the author found that 4 out of 110 became infected with spirochaetal jaundice, which shows that the percentage of infected rats is not very high in comparison with the numbers in other parts of the world. *E. Hindle.*

GAEHTGENS (W.). Beitrag zur Serodiagnose der Weilschen Krankheit. [**A Study of the Serum Diagnosis of Weil's Disease.**]—*Klin. Woch.* 1933. May 6. Vol. 12. No. 18. pp. 697–698.

During the autumn of last year the author tested the agglutination test and fixation of the complement with the sera of 70 patients showing symptoms suggestive of Weil's disease. Twenty-nine serologically positive sera were found, and there was a fairly close agreement between the results obtained by the two methods.

The antigen for the complement fixation test was obtained by centrifuging well-grown cultures of the spirochaetes for 3 to 4 hours at 3,000 revolutions per minute, and making a 10 per cent. suspension of the sediment in normal saline containing 0·3 per cent. phenol. As a rule agglutination went to higher titres than fixation of the complement, but the latter is of value as a control, especially in doubtful cases. *E. H.*

POSTMUS (S.). Het beloop van de seroreactie bij oudlijders aan de ziekte van Weil. [**Serum Reactions in Long Recovered Cases of Weil's Disease.**]—*Nederl. Tijdschr. v. Geneesk.* 1933. June 10. Vol. 77. No. 23. pp. 2648–2651. French summary (4 lines).

In Holland the agglutinins and lysins persist for at least 17 years after an attack of Weil's disease, whilst in the Dutch East Indies, on the contrary, the serological properties of recovered patients only persist for comparatively short periods. *E. H.*

RAT-BITE FEVER.

STEWART (R. Cameron). **Rat-Bite Fever in Canada.**—*Canadian Med. Assoc. Jl.* 1933. June. Vol. 28. No. 6. pp. 608–613. With 1 chart in text. [51 refs.]

A brief history and general description of sodoku, in which it is noted that 85 cases have been recorded from North America. Seven cases which occurred in Canada during the past 10 years are recapitulated in a series of case reports. Six of these cases occurred in Montreal from which it is inferred that a considerable proportion of the rats there must be infective. *E. Hindle.*

PONS (R.). Spirellose fébrile Cochinchinoise. [**Febrile Spirillosis of Cochin-China.**]—*Rev. Méd. et Hyg. Trop.* 1933. Jan.–Feb. Vol. 25. No. 1. pp. 17–23. With 3 figs.

Under the name of *Spirochaeta sinense* the author has described a spiral organism occasionally found in the blood of patients in Cochin China [see this *Bulletin*, Vol. 21, p. 471. From the present description of the cases this infection would seem to be *Spirillum minus*.]

E. H.

MOUREAU (M.) & LE CHUITON (F.). Le chien peut conserver dans son organisme les spirellas du sodoku. [**The Spirilla of Sodoku can persist in the Dog.**]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 26. pp. 1206–1208.

Three dogs were inoculated with *S. minus*; one remained negative but the other two, although showing no clinical signs of the disease, both showed spirilla in the blood. The disease was transmitted from both these dogs to guineapigs by the inoculation of blood. Attempts to infect guineapigs by means of the saliva of all three dogs gave negative results, but the presence of spirilla in the blood shows that the dog is a possible carrier of sodoku. *E. H.*

OZEKI (Yaichiro). Ueber Haarausfall der Mäuse durch *Spirochaeta muris*.]—*Japanese Jl. Dermat. & Urol.* 1933. Mar. Vol. 33. *morsus muris*. [**The Loss of Hair in the Mouse caused by** *S. morsus*.] No. 3. [In Japanese pp. 330–374. With 11 figs. (3 coloured) on 2 plates & 42 text figs. [43 refs.] German summary pp. 52–54.]

A detailed account of the histological changes occurring in mice infected with *Spirillum minus*, with special reference to the pathological changes leading to the loss of hair in the affected animals. Loss of hair occurs within one to two months after infection and affects mainly the belly and chest, and the nasal line including the eyes and ears. There is a slight reddening of the regions where the hair falls out, and histologically the epithelial cells show numerous vacuoles. There is a plentiful cell infiltration of the cutis and subcutis. Between the infiltration and the hair follicles there seems to be a vague connexion and there may be accumulation of cells around the follicles. These changes occur from the 14th day onwards, when the spirilla are extremely rare in the epithelial tissues. They are most numerous in the skin from the 28th to 33rd day after inoculation, and by the 50th day have almost disappeared. The spirilla are much more numerous in the body cavity than in the skin. They are not particularly numerous around the hair follicles, and the loss of hair would seem to be the result of the cell infiltration accompanying the invasion of the epithelial tissues. *E. H.*

PROTOZOOLOGY.

FARJOT (A.). Les protozooses intestinales dans la région du Nord. [**Intestinal Protozoa of the Nord, France.**]—*C. R. Soc. Biol.* 1933. Jan. 20. Vol. 112. No. 2. pp. 200–201.

The examination of a single sample of the faeces of 1,200 patients at the Institut Pasteur of Lille has shown the presence of all the common intestinal protozoa of man. Of the persons with *Entamoeba histolytica* infections, it was noted that 65 per cent. had at one time or another lived in the colonies. The contrary was the case with the giardia infections; 68·5 per cent. had never left France.

C. M. Wenyon.

LÖRINCZ (F.). Ueber das Vorkommen von menschlichen Darmprotozoen in Ungarn. [**Human Intestinal Parasites in Hungary.**] —*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. May. Vol. 37. No. 5. pp. 276–282.

The examination of the stools of 1,206 individuals in Hungary has revealed one or other of the six common intestinal protozoa in 40·9 per cent. It is noted that though *Entamoeba histolytica* infections occur amoebic dysentery is absent, while the amoeba is of very low pathogenicity to cats. The author concludes that the Hungarian strain of amoeba is apathogenic or represents a distinct species, possibly *E. dispar* Brumpt, 1925. *C. M. W.*

TALIAFERRO (William H.). **Infection and Resistance in the Blood-inhabiting Protozoa.**—Reprinted from *Science.* 1932. June 17. Vol. 75. No. 1955. pp. 619–629. With 4 figs. [33 refs.]

The author's work on the mechanism of immunity in protozoal infections is well known, his various papers on the subject having been reviewed from time to time in this *Bulletin.* In the present lecture he summarizes the main results he has obtained in the case of *Trypanosoma lewisi* infection of rats and *Plasmodium cathemerium* infection of canaries.

In the case of the trypanosome he has demonstrated at least two distinct antibodies: the one, which he names ablastin, interferes with the trypanosomes only in that it prevents reproduction, the other is definitely trypanocidal. It would appear that the trypanocidal substances which bring about the first reduction in the number of trypanosomes in the blood is different from that which causes their final destruction when recovery occurs. These substances coexist in the blood but can be separated, for the trypanolytic antibodies are absorbed by trypanosomes which are thereby sensitized so that they are immediately destroyed if injected into a rat, whereas the anti-reproductive substance is not absorbed by trypanosomes which can readily be washed free of it. These antibodies can be transferred by inoculation from rat to rat.

In the case of bird malaria immunity is of another type and is not transferable from bird to bird, for it is due to direct phagocytosis of infected red blood corpuscles by the macrophages, which commences about four hours after a bird has been inoculated and increases throughout the infection with an increase in the reticulo-endothelial system. In this type of immunity there is no reproduction-inhibiting factor. In birds which have recovered the inoculation of a large number of

parasites is followed by their rapid destruction whereas in normal birds the inoculation of a similar dose of parasites is followed by an overwhelming infection. The immunity or power of rapid recovery in the recovered bird is, however, specific and does not extend to all species of bird malarial parasite. Whether this indicates the presence of a specific activating substance in the blood or not has not yet been determined. It would seem possible that though immunity in bird malaria is chiefly cellular there may be a humoral element, just as in the case of the *T. lewisi* infections there is also probably a cellular element, for recurrence of reproduction may follow splenectomy.

All these investigations are of importance from the point of view of immunity in human disease, and the author is approaching the subject of immunity in human malaria by a study of monkey malaria in which he has already found evidence of a parallelism with bird malaria. In conclusion, the author draws attention to the particular value of the blood protozoa for the study of what he believes to be the fundamental problems of immunity. *C. M. W.*

ANDREWS (Mary N.). **A Simple Method of Staining Protozoa in Faecal Films.**—*Chinese Med. Jl.* 1932. May. Vol. 46. No. 5. pp. 476–477.

Wet fixed films of faeces containing intestinal protozoa are usually stained by the iron haematoxylin method or by a simple stain such as Mayer's acid haemalum which requires no differentiation. In this note the author calls attention to the fact that films fixed in Schaudinn's solution may conveniently be stained with Mallory's phosphotungstic haematoxylin made by adding 20 cc. of a 10 per cent. solution of phosphotungstic acid to 80 cc. of distilled water in which 0·1 gm. of haematoxylin has been dissolved. The mixture, which is ready for use after a fortnight's ripening, keeps indefinitely.

C. M. W.

WEISE (W.). Ueber die Giemsafärbung mit gepuffertem Wasser. [**Giemsa Staining with Buffered Water.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. July. Vol. 37. No. 7. pp. 327–337. With 1 coloured plate. [37 refs.]

The author advocates the use of buffered water (pH 7·2) for diluting Giemsa stain.

Not only are constant results obtained, but many natural waters can be used if buffered with the appropriate salts. For special purposes, as for instance the demonstration of stippling on the red blood corpuscles infected with quartan malarial parasites, water buffered to a pH of 7·5 can be used with advantage. The paper describes the method of staining films and sections and gives instructions for preserving the water after buffering from changes due to carbon dioxide in the air. *C. M. W.*

SUAREZ PEREGRIN (Eduardo). Nota previa sobre una nueva aplicación del método de Giemsa para la coloración de los protozoos fecales. [**New Method of Staining Protozoa in Faeces.**]—*Medicina Países Cálidos.* Madrid. 1933. Jan. Vol. 6. No. 1. pp. 5–7. French summary (4 lines).

For staining intestinal protozoa the author has had good results by making films of a mixture of faeces and serum and then fixing

them with methyl alcohol and staining with Giemsa as in ordinary blood film work. *C. M. W.*

DESCHIENS (R.). Culture de l'amibe dysentérique et nutrition de cette amibe dans les cultures. [**Cultivation of the Amoeba of Dysentery.**]—*1er Congrès Internat. de Microbiologie, Paris, 1930.* Vol. 2. pp. 453–456. 1932. Paris: Masson et Cie.

The paper is essentially the same as that reviewed in this *Bulletin,* Vol. 27, p. 275. It is, however, pointed out that the replacement of the powdered dry fish or beef muscle, which was added to the medium referred to just before inoculation with amoebae, by powdered liver, casein, cooked red blood corpuscles or certain vegetable proteids did not lead to any improvement in the culture of amoebae. The presence of ox bile in a strength of 9 per cent. in the liquid portion of the medium stops the growth, while amoebae are rare with strengths of 6 to 8 per cent. *C. M. W.*

KITABATAKE (Eitaro). **Experimental Studies on Amoebic Dysentery. I. On the Vital Staining of** *Entamoeba histolytica.*—*Jl. Oriental Med.* 1933. Mar. Vol. 18. No. 3. [In Japanese. English summary p. 30.]

Testing as many as 167 different stains, the author has found that vital staining of *Entamoeba histolytica* occurs only in the case of basic stains. Stained granules occur only in the endoplasm though the ectoplasm is occasionally stained diffusely. *C. M. W.*

HALAWANI (A. E.). **A Brief Note on a Case of** *Dientamoeba fragilis* **Infection found in Egypt.**—*Jl. Egyptian Med. Assoc.* 1933. Jan. Vol. 16. No. 1. pp. 94–95.

In the stools of a patient in Cairo who, two months before, had been treated with yatren for *Entamoeba histolytica,* large numbers of *Dientamoeba fragilis* were found. The author, who states that in 1930 in England he maintained this amoeba in culture for a few months, notes that this is the first record of its occurrence in Egypt. *C. M. W.*

HEGNER (Robert). **Differential Reactions of Species and Strains of Trichomonad Flagellates to Changes in the Environment.**—*Amer. Jl. Hyg.* 1932. Sept. Vol. 16. No. 2. pp. 513–522.

The author states that the object of the experiments described in this paper was to differentiate species, and strains of the same species of trichomonad flagellates, by means of their reactions to changes in culture media and in temperature.

Three species were employed, *Trichomonas hominis, T. buccalis,* and *T. parva.* Of the last, two strains were used and it was found that according to the test applied they differed from one another more widely than strains of different species from different hosts. Details are given of the relative value of various media, the influence of exposure to various temperatures, the tendency to the ingestion of red blood corpuscles and starch grains and other matters bearing on the subject. *C. M. W.*

SIMIĆ (Tsh.). Le *Trichomonas parva* Alexeief du rat est-il le même que le *Trichomonas intestinalis* Leuckart de l'homme? [**Is** *T. parva* **of the Rat Identical with** *T. hominis*?]—*Ann. Parasit. Humaine et Comparée.* 1933. Jan. 1. Vol. 11. No. 1. pp. 7–16. With 2 figs.

The rat is liable to infection with two species of trichomonas—a large one, *T. muris*, and a small one, *T. parva*. The author claims to have shown that, as regards its morphological and cultural characteristics and its power of infecting experimentally dogs, cats and human beings, the small one is identical with *T. intestinalis* (*T. hominis*) of man, except that the majority of the flagellates possess three instead of four free flagella. Certain rounded forms are figured as cysts. These have been seen by many observers, but the author produces no more evidence than that already existing that they are cysts and not merely unencysted rounded flagellates. *C. M. W.*

BLAND (P. Brooke), GOLDSTEIN (Leopold), WENRICH (D. H.) & WEINER (Eleanor). **Studies on the Biology of** *Trichomonas vaginalis.*—*Amer. Jl. Hyg.* 1932. Sept. Vol. 16. No. 2. pp. 492–512. With 10 figs. [31 refs.]

The authors give an account of a careful study of the morphological and biological characters of *Trichomonas vaginalis*, the paper being a continuation of others previously published.

The great range in size of the organism is noted and it is suggested that the smaller forms, if not representing a distinct species, may be the result of autotomy or the discarding of portions of the cytoplasm of the larger forms. The organism has been cultivated and its behaviour in various media is described. No direct evidence was obtained that *T. vaginalis* was one of the other species of human trichomonas. Attempts to infect the vagina of the rat and guineapig failed.

C. M. W.

WITTE (J.). Bakterienfreie Züchtung von Trichomonaden aus dem Uterus des Rindes in einfachen Nährboden. [**Bacteria-Free Cultivation of Trichomonas from Uterus of Cow.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Apr. 28. Vol. 128. No. 3/4. pp. 188–195. With 3 figs. [26 refs.]

By inoculating the bacteriologically sterile uterine contents of cows into various media, bacteria-free cultures of trichomonas were obtained.

The organism grows readily in various media, the simplest being serum bouillon or peptone bouillon to which 5 to 10 per cent. of defibrinated horse, ox, sheep or goat blood has been added. The author thinks that the trichomonas differs from forms hitherto described and proposes to name it *Trichomonas genitalis* in spite of the fact that RIEDMÜLLER in 1928 suggested the name *Trichomonas foetus* for the same organism. *C. M. W.*

POGGI (Igino). Infestazione da *Giardia intestinalis* nei bambini. [**Giardiasis in Children.**]—*Arch. Ital. Sci. Med. Colon.* 1933. May 1. Vol. 14. No. 5. pp. 332–351. With 1 fig. [33 refs.] English summary (6 lines).

In the course of examining 1,100 children in Milan the author found *Giardia lamblia* in the stools of 98 or 9 per cent. of whom 38

either had at the time, or intermittently in the past, symptoms of gastro-enteritis. Of the 98 there were 67 male and 31 female while more than two-thirds (68) were below the age of 8 years. *H. H. S.*

BROMBERGER & V. ARNIM. [Ueber gehäuftes Vorkommen von Lambliosis intestinalis in einem Arbeitsdienstlager in der Mark. [**Focus of Lamblia Infection in a Labour Camp in Prussia.**]—*Muench. Med. Woch.* 1933. Jan. 6. Vol. 80. No. 1. pp. 12–13.

The investigation of cases of gastro-enteritis which occurred in a labour camp revealed the fact that 50 per cent. were infected with lamblia. Of 14 healthy individuals only 2 were found to be infected. Treatment with a single injection of 0·6 gm. of neosalvarsan brought about a disappearance of the symptoms and the infection.

C. M. W.

GALLIARD (H.). Infections à *Trypanosoma duttoni* Thiroux chez les animaux splénectomisés. [*T. duttoni* **Infection in Splenectomized Animals.**]—*Bull. Soc. Path. Exot.* 1933. Apr. 5. Vol. 26. No. 4. pp. 609–613.

The author has tested the influence of splenectomy in the case of *Trypanosoma duttoni*, a trypanosome which normally behaves in mice as does *T. lewisi* in rats.

Mice inoculated 24 to 48 hours after splenectomy acquire infections which are very much heavier than normal if the injections have been made intraperitoneally, but not if made subcutaneously. The duration of the infections, however, varies little from the normal. If splenectomy is performed during an established infection it has little influence, except that it appears to inhibit reproduction of the trypanosomes if performed a very short time after inoculation, or to produce in some cases a temporary disappearance of the parasites and to lengthen the duration of the infection if performed two to three months after.

C. M. W.

GALLIARD (H.). La culture de *Trypanosoma somalense* Brumpt 1903 de *Bufo regularis*. [**Cultivation of** *T. somalense* **of the Toad.**]—*C. R. Soc. Biol.* 1933. Apr. 10. Vol. 112. No. 13. pp. 1325–1327.

From the heart blood of the African toad, *Bufo regularis*, specimens of which were brought to France by BRUMPT from the Sudan, cultures of *Trypanosoma somalense* Brumpt were obtained.

The trypanosome grows readily in almost any medium containing blood and remains alive for many months at 20°C. to 25°C. if drying is prevented. The cultural forms in most media are exclusively of the leptomonas or crithidia type, trypanosome forms appearing only in cultures made in Ponselle's hypotonic medium consisting of equal parts of doubly distilled water and defibrinated rabbit's blood. The trypanosome differs from *T. inopinatum* of the edible frog which directly from the frog's blood will, as a rule, grow only in Ponselle's medium though subcultures will succeed in other media. In Ponselle's medium the author has also cultivated *Trypanosoma cruzi* and *T. parroti* of *Discoglossus pictus*. *C. M. W.*

KATAYAMA (N.). Experimentelle Untersuchungen ueber die Infektion von Ratten mit Kulturformen des *Trypanosoma Lewisi* von der Maulschleimhaut aus. I. Mitteilung. [**Infection of Rats by the Mouth with Culture Forms of** *T. lewisi*.]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Mar. 31. Vol. 128. No. 1/2. pp. 125–129.

Unlike the blood forms, but like the infective forms in the faeces of fleas, the cultural forms of *Trypanosoma lewisi* are able to pass through the intact mucous membrane of the mouth of rats and to produce infections. *C. M. W.*

i. NATTAN-LARRIER (L.) & NOYER (B.). Infection expérimentale du rat par le trypanosome du hamster. [**Experimental Infection of Rat with Hamster Trypanosome.**]—*C. R. Soc. Biol.* 1932. Dec. 16. Vol. 111. No. 39. pp. 887–889.

ii. —— & ——. Les cultures du trypanosome du hamster (*Trypanosoma rabinowitchi*). [**Cultivation of the Hamster Trypanosome.**]—*Ibid.* 1933. Feb. 17. Vol. 112. No. 6. pp. 523–525.

iii. —— & ——. Formes de multiplication de *Trypanosoma rabinowitchi* dans le péritoine du Rat.—*Ibid.* Vol. 113. No. 18. pp. 143–146. With 11 figs.

iv. —— & ——. Multiplication et division des formes schizogoniques de *Trypanosoma rabinowitchi*.—*Ibid.* No. 24. pp. 831–834. With 2 figs.

v. —— & ——. Les enveloppes capsulaires des formes schizogoniques de *Trypanosoma rabinowitchi*.—*Ibid.* No. 25. pp. 1011–1014. With 2 figs.

vi. —— & ——. Cycle évolutif de *Trypanosoma rabinowitchi* dans le péritoine du rat.—*Ibid.* No. 26. pp. 1111–1115. With 2 figs.

As other observers have noted, the authors have found it impossible to infect rats with *Trypanosoma rabinowitchi* by inoculating them with the blood of infected hamsters. On the other hand they have succeeded in infecting them by intraperitoneal injection of 3-months-old cultures on rabbit blood agar or 48-hours-old cultures on rat blood agar. In both cases the cultures contained trypanosome forms of the parasite. A first or even a second subinoculation could be made, but never a third. It was noted that the injection of cultures into the peritoneal cavity of the rats was followed by rapid multiplication of the trypanosomes locally and that this peritoneal infection persisted after the blood forms had disappeared. By subinoculating rats intraperitoneally with peritoneal exudate instead of with the blood it was possible, commencing with newly-born rats, to carry on the infection even in adult rats for as many as seven passages.

The authors continue the record of the results of their experiments with *Trypanosoma rabinowitchi* of the hamster. It is shown that the trypanosome grows better in a medium made with the blood of the white rat than with that of the rabbit. Growth appears to be better at 37°C. and metacyclic trypanosomes are produced more rapidly at this temperature than at 18°C.–22°C.

By injection of cultures into the peritoneal cavity of young rats a blood infection of ordinary trypanosome forms results. In the peritoneal cavity, however, a remarkable type of developmental form occurs. This may be regarded as having been produced by repeated division of the nucleus and formation of new flagella associated

with a broadening of the flagellar end of the organism without division of the cytoplasm. There result large triangular or fan-shaped organisms in which a row of nuclei and blepharoplasts, each with its flagellum, occupy the base of the triangle. There may be as many as 120 nuclei, such a form measuring 100 μ to 105 μ across. It is evident that this is a condition of extreme delay in cytoplasmic division while nuclear division has been proceeding.

It would appear that the triangular form of the multinucleate individuals is retained on account of a kind of capsule which prevents the cytoplasm from dividing. If the multinucleate mass escapes from the capsule rapid segmentation into ordinary crithidia forms occurs.

The capsule is a definite structure which stains a pink colour, and which, by moving the objective up and down, can be seen to be striated. Preparations made from the peritoneal exudate of rats on the third day of the infection reveal numerous empty capsules.

A further study reveals the fact that a few drops of culture inoculated into the peritoneal cavity of young rats is followed by a period in which no flagellates are detectable, a later one in which the schizogonic forms described above occur, and a final one in which trypanosomes of the blood type appear to be followed by the entry of these forms into the blood, the whole cycle occupying three to four days. The suggestion is made that the schizogonic forms are comparable with developmental stages in the flea, and that this trypanosome together with perhaps *T. primatum* should be classified in a special group apart from other trypanosomes. *C. M. W.*

SCHWETZ (J.). Sur les parasites malariens (*Plasmodium*) des singes supérieurs (anthropoides) africains. [**Malarial Parasites of African Anthropoids.**]—*C. R. Soc. Biol.* 1933. Feb. 24. Vol. 112. No. 7. pp. 710–711.

The examination during three months of the blood of a chimpanzee about a year old, every day or on alternate days, at Stanleyville showed that malarial parasites were constantly present. They varied in character from day to day but could be classified as belonging to the three species commonly found in man. It was concluded that the chimpanzee had a triple infection. *C. M. W.*

SCHWETZ (J.). Sur les parasites malariens (*Plasmodium*) des singes inférieurs africains. [**Malarial Parasites of the Lower African Monkeys.**]—*C. R. Soc. Biol.* 1933. Apr. 1. Vol. 112. No. 12. pp. 1220–1222.

The examination of the blood of a large number of monkeys belonging to different genera in the Belgian Congo has revealed malarial parasites which do not correspond entirely with the descriptions of *Plasmodium kochi*. The author thinks that a new name should be given to the parasite or the description of *P. kochi* modified. What is a little confusing is the statement in one place that adult schizonts occur in the peripheral blood, and in another that the division forms in red blood corpuscles have not been found on a single occasion. The parasite requires to be studied in its whole cycle, possibly in experimentally inoculated animals. *C. M. W.*

JAMES (S. P.), NICOL (W. D.) & SHUTE (P. G.). *Plasmodium ovale* **Stephens 1922.**—*Parasitology.* 1933. Feb. Vol. 25. No. 1. pp. 87–95. With 14 coloured figs. on 1 plate. [14 refs.]

In this paper the authors give some further details of the morphology of *Plasmodium ovale* both in man and *Anopheles maculipennis*, particularly from the point of view of the identification of the parasite, which will be considerably simplified by the beautiful coloured plate by Mr. JOBLING illustrating the paper.

A discussion of previous records of parasites which may or may not have been *P. ovale* leads to the conclusion that CRAIG described but did not name the parasite in 1900 and that the form recorded by EMIN in 1914, which was commented upon and named *Plasmodium camarense* by ZIEMANN, was either a severe infection of *P. falciparum* with schizonts in the blood or a mixed infection of this parasite and *P. vivax*. A very important point is made, namely that in blood films of other malarial parasites of man occasionally abnormal forms bearing some resemblance to *P. ovale* may be seen, but this is not sufficient to warrant the conclusion that *P. ovale* is an abnormal form of one of the commoner parasites. It is the discovery of all stages of development and their constant morphological character, that justifies the establishment of *P. ovale* as a distinct species.

C. M. W.

GARNHAM (P. C. C.). **A Note on the Subtertian Malaria Parasite of Kenya.**—*East African Med. Jl.* 1933. June. Vol. 10. No. 3. pp. 68–84. With 1 plate & 1 folding chart. [22 refs.]

The author points out that owing to the fact that relatively large forms of the malignant tertian parasite occur commonly in the peripheral blood of cases of malaria in Kenya, infections with this parasite have often been diagnosed as quartan malaria. The realization of the fact that the infection was not of this nature has led the author to study the Kenya parasite carefully. He has come to the conclusion that it differs from the classical malignant tertian parasite.

Thus small unpigmented rings occur in the blood, but they are always accompanied or followed by solid (or slightly vacuolated) large and sometimes pigmented parasites. The pigment instead of being a fine black granular formation in the early stages and a black mass in the later ones, is at first a fine yellow powder which later becomes a collection of dark granules with a bright lustre in a golden vacuole. Finally the schizont of the Kenya parasite frequently occupies three-quarters or more of the red blood corpuscle and is commonly found in the peripheral blood instead of being rare in the blood and occupying only a third or a half of the red cell. Certain forms corresponding with the description of *Plasmodium tenue* of man occur but they could not be differentiated as a distinct species.

It seems quite possible that the Kenya form of the malignant tertian parasite may be distinct from that of Europe and other places, but the reviewer is led to wonder if some of the differences noted by the author may not have been due to the "modified ROMANOWSKY method of staining." In any case he is comparing the Kenya parasite with those which were certainly not stained by this method. The diagnosis of the parasite, the author emphasizes, may be established only after the examination of several films, while complete confirmation may entail culture of the parasite or spleen puncture. It is

evident that further observations are required and comparisons made under absolutely identical conditions before the actual differences can be accurately defined. *C. M. W.*

ALESSANDRINI (Giulio). Sopra un particolare meccanismo di sviluppo (amitosi) della *Laverania malariae* e sulla genesi delle perniciose. [**Development of** *Plasmodium falciparum.*]—*Arch. f. Protistenk.* 1933. Vol. 79. No. 3. pp. 356–379. With 9 figs. & 2 plates (1 coloured). [17 refs.]

The possibility that the parasite of malignant tertian malaria is able to reproduce by binary fission in its young stages as well as by the recognized method of multiplication by schizogony has been suggested by a number of observers. LE DANTEC (1929) quoted by the author of the paper under review, was emphatic on this point, and recorded in support of the view a fatal case of malaria in which ring forms of *P. falciparum* alone were found in the blood during life and in enormous numbers in the spleen after death.

To test the accuracy of these views the author has made direct observations on the blood. His technique was to place a small drop of blood from a malarial case on the centre of a cover glass, and to invert it over a hollow slide containing a drop of saline solution. The hanging drop preparation sealed with vaseline was studied on the warm stage. Not only does he claim to have followed the actual division of the young parasites, but also the penetration of red blood corpuscles by free merozoites, thus confirming as no other person has yet done, SCHAUDINN'S observations and, what seems to be more remarkable, the division of the nucleus of the young parasite which precedes division of its cytoplasm. He does not say what magnification was employed, but the drawings depicting these processes suggest that at least an oil immersion lens was used. In the drawings the parasites and the nuclei are very clearly defined, more clearly even than one would expect to see them in the thinnest preparation of fresh blood observed with the highest power and best illumination. In the author's case, as noted above, a hanging drop in which it must be very difficult to observe single parasites was used. The author furthermore, states that the division is amitotic, a term which he seems to use as synonymous with binary fission, which of course it is not. In addition to the statements noted above there is much speculative matter in the paper regarding the possible rate of multiplication of the malarial parasite by this rapid method of binary fission and the conditions under which it occurs. The conclusion is that reproduction by this method takes place only when the power of organic defence of either man or the mosquito, or both, against the malarial parasite is found to occur.

It is clear that much confirmatory work is required before the views expressed can be accepted. *C. M. W.*

BOUCHER (H.). Coloration vitale de mitochondries dans le *Plasmodium vivax.* [**Vital Staining of Mitochondria in** *P. vivax.*]—*C. R. Soc. Biol.* 1933. Mar. 10. Vol. 112. No. 9. pp. 882–883.

Mitochondria can be demonstrated in the malaria parasite *Plasmodium vivax* by vital staining with Janus green.

The stain is prepared as follows: Of a saturated solution in absolute alcohol of neutral red 0·4 cc. is added to 10 cc. of absolute alcohol to

which is added also three drops of a saturated alcoholic solution of Janus green. A drop of this is allowed to dry on a perfectly clean slide and the moist blood preparation is made on the thin film of stain. The mitochondria in the form of spherical granules stained by the Janus green half a micron in diameter vary in number from 1 to 20 according to the size of the parasite. The neutral red stains granules in the red blood corpuscles, the rose coloration assumed by the cytoplasm of the parasite being due to a reduction product of the Janus green. *C. M. W.*

MANWELL (Reginald D.). **The Behavior of the Avian Malarias in the Common Fowl, an Abnormal Host.**—*Amer. Jl. Trop. Med.* 1933. Jan. Vol. 13. No. 1. pp. 97–112. [13 refs.]

To test the susceptibility of the common chicken (*Gallus gallus*) to bird malaria, a number were inoculated with five species of parasite available: *Plasmodium praecox, P. circumflexum, P. cathemerium, P. rouxi* and *P. elongatum*. Infections lasting from three to ten days were produced by the first three only, but these were so slight that usually they could only be detected by inoculating the chicken's blood into canaries. Occasionally, however, gametocytes could be seen in the blood so that it is presumed mosquitoes might become infected by feeding on such chickens. *C. M. W.*

CHORINE (V.). Conditions qui régissent la fécondation de *Plasmodium praecox*. [**Conditions regulating the Fertilization of** *P. praecox*.]—*Arch. Inst. Pasteur d'Algérie.* 1933. Mar. Vol. 11. No. 1. pp. 1–8.

The author, who in collaboration with MARCHOUX (this *Bulletin*, Vol. 29, p. 817) studied the factors regulating the fertilization in the case of the Haemoproteus of the Java sparrow, has now shown that in the case of the malignant tertian malarial parasite the regulation is the same. The reason why flagellation does not occur in the blood is that carbon dioxide is present. Its escape from the blood after removal from the body allows flagellation to occur. There is nothing specific in the carbon dioxide as any acid acts in the same way.

C. M. W.

GARNHAM (P. C. C.). **On Some Curious Bodies found in Erythrocytes containing Immature Crescents.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. Jan. 31. Vol. 26. No. 4. pp. 401–403. With 1 plate.

Working in East Africa the author has noted that the red blood corpuscle containing a developing crescent of *Plasmodium falciparum* may in addition contain a dark red rod which, if short, may be straight, or if too long for the cell twisted into a ring or loop or coiled. These structures, which are best seen in films stained deeply enough to show Maurer's clefts, have a very striking appearance as shown in the illustration accompanying the paper. Their nature is obscure.

C. M. W.

HEWITT (James Arthur). **Sarcosporidiasis in Human Cardiac Muscle.**—*Jl. Path. & Bact.* 1933. Jan. Vol. 36. No. 1. pp. 133–139. With 4 figs. on 2 plates. [17 refs.]

In sections of human heart muscle being used for instructional purposes sarcosporidia were discovered. On account of bad fixation

the author says that the material was "obviously of very limited use for detailed observation of the cysts and the cytology of the contents," yet he describes peculiarities in the shape and size of the spores and even considers the possibility of a distinct species of parasite being represented. *C. M. W.*

FENG (Lan-Chou). **Sarcosporidiosis in Man. Report of a Case in a Chinese.**—*Chinese Med. Jl.* 1932. Oct. Vol. 46. No. 10. pp. 976–981. With 3 figs. on 1 plate. [13 refs.]

A record of sarcosporidial infection of a Chinese, discovered when a small piece of muscle removed from the thigh at operation for diagnostic purposes was sectioned. *C. M. W.*

TANABE (Misao) & KOMADA (Kan-ichi). **On the Cultivation of** *Balantidium coli.*—*Keijo Jl. of Med.* 1932. Sept. 30. Vol. 3. No. 3. pp. 385–392 (45–52). With 2 figs. [11 refs.]

The paper describes the cultivation of *Balantidium coli* from the pig in Fränkel's medium to 16 parts of which 1 part of horse serum is added.

The medium consists of asparagin 4 gm.; ammonium lactate 6 gm.; K_2HPO_4 2 gm.; NaCl 5 gm.; distilled water 1,000 cc. After autoclaving, the medium is cooled, the serum added and 10 cc. amounts distributed in test tubes. To each tube just before use three loops of rice starch sterilized by dry heat are added. In this at temperatures from 30°C. to 37°C., but not below, the ciliate grows readily but aerobically and anaerobically. Conjugating forms were frequently observed but cysts were absent. *C. M. W.*

HANNEBORG (Øystein). Balantidium coli-diaré og intestinal polypose. [*Balantidium coli* **causing Intestinal Polyp and Diarrhoea.**]—*Norsk. Mag. f. Laegevidenskapen.* 1933. June. Vol. 94. No. 6. pp. 650–659. With 2 figs. English summary. [41 refs.]

A farmer, 67 years of age, was admitted to hospital with a history of diarrhoea of three years duration. Examination revealed intestinal polyposis and infection with *Balantidium coli.* Treatment with hexamethyltetramine by the mouth and injections of 1 per cent. quinine solution per rectum cured the patient, though the intestinal polyps remained unaltered. *C. M. W.*

FRANCHINI (G.) & TADDIA (L.). Sopra un caso di balantidiosi. [**Infection by** *Balantidium coli.*]—*Arch. Ital. Sci. Med. Colon.* 1933. May 1. Vol. 14. No. 5. pp. 321–325. English summary (5 lines).

The case here described, the second to be diagnosed at the Institute of Colonial Pathology, Bologna and Modena, is that of a woman of 40 years complaining of colicky pains, tenesmus, and loose stools containing mucus; *Balantidium coli* was present in abundance.

Enemata of yatren 105 led to a speedy cure which appears to be permanent, no parasites having been seen after repeated search.

H. H. S.

NAGAHANA (Misao). **The Morphology and Culture of a Balantidium found in the Wild-Rat** (*Mus norvegicus* **Erxl.**).—*Keijo Jl. of Med.* 1932. Dec. 31. Vol. 3. No. 4. pp. 492–500 (36–44). With 15 figs. on 2 plates. [17 refs.]

On examining a wild rat (*Mus norvegicus*) which was caught near pig sties and had been sent to the laboratory in Keijo the author found it to be infected with a Balantidium indistinguishable from *Bal. coli* of man. It occurred in the large intestine, caecum and lower part of the small intestine. Macroscopically the intestine appeared normal but in sections invasion of the mucosa and submucosa of the caecum was revealed. The organism was successfully cultivated for many generations in a medium consisting of Fränkel's medium and horse serum which had been used successfully by TANABE and KOMADA for the cultivation of *Bal. coli*. *C. M. W.*

MONIER (H.) & DANG-TEH-TRINH. Note sur un infusoire parasite et pathogène. [**A Pathogenic Infusorian.**]—*Bull. Soc. Path. Exot.* 1932. Dec. 14. Vol. 25. No. 10. pp. 1049–1053. With 2 figs.

In the stools of an Annamite child admitted to the Vientiane hospital for dysentery a ciliate was discovered. It was pear shaped, had an antero-lateral tuft of cilia leading from a cytostome and measured 15 μ to 40 μ in length. Encysted forms 7 μ to 15 μ in length were said to be present. It is not clear on how many occasions the ciliate was observed, and though the author would place it in the genus *Nyctotherus*, the figures and description hardly give the details necessary for an accurate identification. *C. M. W.*

KNOWLES (R.) & BASU (B. C.). **The Nature of the So-Called 'Black Spores' of Ross in Malaria-transmitting Mosquitoes.**—*Indian Jl. Med. Res.* 1933. Jan. Vol. 20. No. 3. pp. 757–776. With 4 plates. [33 refs.]

The authors again raise the question of the nature of the "black spores" of ROSS upon which BRUCE MAYNE wrote so fully in 1929, concluding that they had nothing to do with malarial oocysts but were due to thickening and fragmentation of tracheal tubules (this *Bulletin*, Vol. 27, p. 273).

They speak of the doubt which still exists and account for it by supposing that under the name "black spore" at least three different structures have been confused. These are degenerated and hyper-pigmented malarial oocysts, "chitin corpuscles" or thickenings of the tracheal system, and fungus infections of the tracheal system. The second are the structures studied by BRUCE MAYNE but the first alone are true "black spores" of ROSS. The authors illustrate what they conclude is the evolution of the "black spore" from malarial oocysts in the wall of the midgut of *Anopheles stephensi* but it must be admitted that their fully developed "black spore" does not bear much resemblance to ROSS's illustration which they reproduce. *C. M. W.*

LWOFF (A.). Existence d'une Bartonellose aiguë des souris non splénectomisées. Autonomie d'*Eperythrozoon noguchii* Lwoff et Vaucel. (Réponse aux critiques de M. W. Kikuth et remarques sur l'étiologie de la fièvre de Oroya.) [**Acute Bartonellosis of Intact Mice.**]—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 397–401.

As a result of the author's studies conducted alone or in conjunction with others, two strains of *Bartonella muris* were isolated. The one appeared spontaneously in a mouse infected with *Trypanosoma cruzi*, and the other in a splenectomized mouse infected with *Eperythrozoon*. The two races were morphologically identical, but the spontaneous virus produced in normal mice massive infections, whereas the other did so only in splenectomized mice. VAUCEL moreover demonstrated that recovery from the one infection did not leave immunity against the other.

In a recent article KIKUTH doubts if the spontaneous virus, which is culturable in blood media, is actually a *Bartonella*. He suggests some bacterial infection. Again having observed rounded or coccal forms of *Bartonella canis* he takes exception to the author's and VAUCEL's view that the microphotographs published by NOGUCHI to illustrate *Bartonella bacilliformis* in the blood of the monkey show not only this parasite but another, overlooked by NOGUCHI, an *Eperythrozoon* which they named *E. noguchii*, and suggested might be the actual cause of Oroya fever. This disease they regard as quite distinct from verruga which is caused by *B. bacilliformis*. They conjecture that the two viruses often coexist in the same patient and that in consequence the two conditions, verruga and oroya fever, have been regarded as two phases of one disease. The author replies at length to KIKUTH's criticism and attempts to establish his position by a series of ingenious arguments which in some cases at least are based on analogy rather than on experimental data. *C. M. W.*

FRANCHINI (J.). Balantidiose humaine.—*Bull. Soc. Path. Exot.* 1933. Feb. 8 & 9. Vol. 26. No. 2. pp. 175–178. [Italian version has been reviewed.]

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By the South Essex Recorders, Ltd., High Road, Ilford.

(597) Wt. P1/101 1875 10/33 S.E.R. Ltd. Gp. 353.